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Section of Anæsthetics.

President—Dr. Z. MENNELL.

The Physiological Basis of Hypnosis and Suggestion.

By S. R. WILSON, M.B., B.S., M.Sc., F.R.C.S.Ed.

A STUDY of the functions of the higher parts of the central nervous system is of supreme interest and importance to all concerned in the practice of anæsthesia, and yet in spite of much anatomical, histological, and experimental research, there is very little physiological evidence to guide us to explanations of function. It was on this account that I decided to bring before this Section a theory, originally propounded before the Oldham Medical Society in 1915, which appeared to provide a foundation for the interpretation of some of these phenomena. Whilst it presents many difficulties, its value as a working basis in the investigation of hypnotic and suggestion phenomena, and the independent confirmation it has received from Professor Pawlow's work on conditioned reflexes in animals, encourage me to bring it to your notice in the hope of stimulating further communications.

I know of no subjects so much mistrusted, not only by the general public, but also by the majority of the medical profession, as those of hypnosis and suggestion, although they are extensively, if unconsciously, practised by the latter; this, no doubt, is explained by the fact that accurate scientific data in regard to them have not previously been clearly given. It will be my endeavour to show that the phenomena of hypnosis and suggestion are capable of as clear and scientific an explanation as are the physiological workings of the various organs of the body, and with the appreciation of such data this atmosphere of mystery and scepticism must vanish.

My observations are entirely the result of personal experience based upon modern knowledge of the physiology of the nervous system. Many years ago I witnessed a remarkable demonstration which was said to depend upon hypnosis; I returned from it, pondering: had I witnessed a genuine phenomenon, or had I been hoaxed? I finally concluded that what one man could do, another could repeat, particularly a medical man, who, by virtue of his anatomical and physiological knowledge, possessed an insuperable advantage over the layman. My early experiments were apparently failures, and I was tempted to believe that I did not possess the magnetic or vital force, or whatever was necessary to produce these phenomena. Yet, looking back I now realize that I did not really fail, but rather that I was expecting too much; this no doubt explains how it is that many investigators abandon the subject at the very outset, who would never try, say, to play a difficult piece of music without devoting endless hours to the practice of scales. No mysterious or vital force is necessary, but knowledge and perseverance; granted these, the various effects about to be demonstrated are attainable by any one.

The particular theory which I wish to bring forward is that the various phenomena of hypnosis and suggestion are reflex actions—conditioned reflexes—(Pawlow) taking place in the subconscious layers of the brain, the existence and mode of action of which I hope shortly to demonstrate to you. To this end, a short consideration of reflex action is necessary and desirable. Physiologists now classify reflexes as unconditioned and conditioned reflexes. Unconditioned reflexes are those in which the reflex response is fixed and unvaried, and independent, or practically so, of conscious intervention or surrounding conditions. It is a legacy to the individual from past

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generations. The pupillary reflex, the corneal reflex, the knee-jerk and various visceral reflexes are examples. Conditioned reflexes are those in which the experimenter has something to say as to what will happen. They are really acquired reflexes dependent on the surroundings or developed from the conscious efforts of the individual. They have been especially investigated by Professor Pawlow. Most of his investigations were made on the reflex secretion of saliva in dogs. A sound of a definite vibration frequency was used as a conditioned stimulus. After several repetitions of the sound in conjunction with feeding, the conditioned stimulus produced a secretion of saliva even if no food were forthcoming, but a sound of a different vibration frequency was entirely ineffective. Or instead of a musical note an electrical stimulus may be applied to one paw. After a time this produces salivary secretion and the dog exhibits no discomfort, but if the same shock is applied to another paw there is no secretion of saliva and the limb is withdrawn from the irritant. Another way of studying conditioned reflexes is to have two exactly similar kennels, one containing meat, whilst in the other an electric shock is arranged. The dog goes up to both kennels but there is nothing to guide him as to which he should enter. If he is lucky he enters the food kennel and stays there; if he enters the other kennel he receives a shock and promptly withdraws. In repeating this test a blue disc is placed over one kennel and a red disc over the other, and these are changed about concurrently with the food and electric shock. After a time the dog with unerring accuracy walks into the food kennel. He does not gaze at either disc. He has no conscious knowledge of it, but if there is a red disc above the food kennel, that red spot is photographed on the dog's retina as an image and this is transmitted to the subconscious brain. The dog instinctively enters the right kennel but is entirely unconscious as to why he does so.

An unconditioned reflex may be transformed into a conditioned reflex. Thus a tap on the ligamentum patellæ produces the knee-jerk, which is an unconditioned reflex, but if whenever the tendon is tapped, a flash of light is directed into the eye, after a time the knee-jerk occurs in response to the visual stimulus alone.

Now, the manifestations of the cerebral reflex actions of hypnosis and suggestion are complicated by the presence of the volitional layer in the brain, and if the action of this layer be eliminated, it will be found that the cerebral reflexes obey exactly the same laws as those which govern the more clearly understood spinal reflexes.

Yet, even in the case of the spinal reflexes, the volitional layer of the brain presents difficulties. As an instance of this, one may cite the various methods brought forward by physicians for eliciting the knee-jerk. The phenomenon is known as reinforcement of the knee-jerk, and may be variously demonstrated. The patient is told to grip the hands tightly, or to look at the ceiling, or to read aloud from a book whilst the tendon is tapped. All the methods act by distracting the conscious attention of the patient from the reaction. Physiologists also recognize the disturbing influence of the conscious brain on reflex action, and therefore experiment on animals whose mid-brain stems or upper spinal cords have been divided so as to exclude all cerebral influence. The principles underlying the reflex actions of the mammalian cord have been largely worked out by Professor Sherrington, who experimented on dogs in which the spinal cord had been transected in the lower region. One reflex he particularly investigated was the "scratch reflex."

If such a dog be stimulated in the saddle area on one side or the other, the hind leg of the same side performs the scratch reflex. What will happen if both sides be stimulated at once? Will both hind limbs move, or only one, or neither? Sherrington tested this and found that *only one hind limb moved*. From this he deduced that great fundamental "principle of the common path" which is of vital importance in explaining all reflex actions. He pointed out that whilst there are

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numerous channels along which impulses can pass in the central nervous system, yet for any particular reaction there is a "final common path" which can be occupied by only one impulse at a time. Further, he worked out the laws controlling the occupation of the final common path; these may be briefly stated as follows:—

(1) If two impulses try to gain entrance, the first arrival secures possession of the common path.

(2) If the two impulses arrive simultaneously, the stronger gains the path.

(3) Even if the path be already occupied, a second impulse can displace the first after an interval, unless the first be reinforced.

These are the chief factors controlling the occupation of the common path, and they are of extreme importance for the proper appreciation of the following observations on the workings of the cerebral reflex centres.

We have dealt with conditioned reflexes and with some of the main principles of reflex action. We have still to consider the question of the subconscious brain.

The grey matter of the human brain has been variously described by observers as consisting of five, seven, or even eleven layers, but for practical purposes the layers can be reduced to five. The topmost, the molecular layer, is largely composed of nerve fibres and neuroglia, is mainly concerned in conduction, and will be neglected in the present discussion.

The same is true of the fourth layer or inner line of Baillarger, which forms a well-marked band of nerve-fibres. The grey matter of the cortex may be regarded as consisting of three layers of nerve-cells, an outer or pyramidal layer, a middle or granular layer, and an inner or polymorphic layer. For convenience of reference these three layers will be referred to as the supra-granular, granular, and infra-granular layers respectively.

Our knowledge of localization of cerebral function dates back to 1870, when Hitzig and Fritsch demonstrated the excitability of the cerebral cortex of the dog, and a year or two later their work was greatly extended by Ferrier. This line of research reached its culmination in 1903, when Sherrington and Grünbaum discriminated between the functions of the pre- and post-central convolutions of the monkey's brain. Since then great progress has been made in localization of cerebral function by the histological method. For this advance we are largely indebted to the independent researches of Campbell and Brodmann, and to the writings of John Shaw Bolton. As a result of their work it would appear that there is localization in depth as well as on the surface, and deductions may be drawn as to the function of these three layers. I will briefly indicate the lines along which this knowledge has developed. These three layers of nerve-cells vary in thickness in different animals; they exhibit alterations in depth at different periods of life; they show modifications in different parts of the same brain, and manifest certain variations in cases of mental disease. Taking each layer in turn, the deductions arrived at may be shortly summarized.

The infra-granular layer is present throughout the mammalia. It is just as well developed in the lower mammals as in the human subject. In the six-months' fœtus it is three-quarters, at birth four-fifths, of its depth as in the adult. It is present all over the surface of the brain, and shows no change in the ordinary forms of mental disorder, but in the grosser forms of mental disease when man sinks lower than an animal and ceases to pay attention to the ordinary bodily functions and to cleanliness, the infra-granular layer shows signs of degeneration. Its functions are to subserve the lower or instinctive animal activities which are as well developed in the lower mammals as in ourselves. The infra-granular layer is the instinctive layer of the brain. Passing on to the granular layer, we find that in a six months' fœtus it is one-half, at birth three-quarters, as well developed as in the adult. It is well-developed in the higher carnivora and primates. It is present all over the brain but

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attains its greatest development in the occipital region, which we know to be associated with vision. In this situation it is subdivided into two parts by an additional layer of fibres known as the stria of Gennari. In cases of congenital optic atrophy it is greatly reduced in thickness, and in long-standing cases of complete blindness it exhibits evidences of degeneration. Its functions are to subserve the reception and transformation of sensory impressions, whether from lower sensory neurons or from other parts of the brain. It is the artistic layer of the brain and the seat of music, mathematics and subconscious memory. It explains the precocity of mathematical and musical genius, since the granular layer upon which these faculties depend is almost fully developed in the 'teens. Subconscious memory is perfect, it is only the intrusion of consciousness that causes its apparent limitations. If a printed sheet is held for a moment before our eyes, we probably notice consciously only a few words. But every single word of it is photographed upon our retina and a record of it stored up in the subconscious brain and is recoverable if proper means of tapping the subconscious brain be utilized. Every single message received by the brain is unconsciously docketed by it. (A demonstration of this was given on a subject, in hypnosis under which condition facts of early life entirely unknown to the conscious individual were elicited.) Abstruse memory is always more perfect in early life than later, for the infra-granular and granular layers are very well developed, while the inhibitory or supra-granular layer is comparatively immature and interferes little with these reactions.

The supra-granular layer is practically absent in the lowest mammals. It grows progressively thicker the higher one ascends the mammalian scale and attains its maximum thickness in man, in whom it becomes thicker than all the other layers put together. In the six months' fœtus it is about one-quarter, at birth it is one-third, as deep as in the adult. It attains its maximum development in the pre-frontal region of the human brain, which we know from other evidence to be associated with intelligence and reason. It is under-developed in cases of congenital mental deficiency and shows retrogressive changes in the ordinary forms of mental disorder. Its functions are to subserve the higher psychical or associational functions of the brain, which constitute intelligence and reason. The supra-granular layer represents the intelligence layer of the human brain.

To recapitulate: the grey matter of the surface of the human brain consists of three layers of nerve cells, namely, the infra-granular or instinctive layer, the granular or artistic layer and the supra-granular or intelligence layer.

The supra-granular layer constitutes the conscious brain and is governed by certain definite laws, viz., the laws of argument and reason, and nothing else. The granular and infra-granular layers together constitute the subconscious brain and are not amenable to the laws of argument and reason, but obey the laws of reflex action as enunciated by Sherrington.

It is a lack of appreciation of these facts which has led to so much confusion on this subject. People constantly try to interpret the reactions of the subconscious brain by the laws of argument and reason, which are applicable only to the conscious brain. Sufferers from functional nerve ailments cannot understand why they are unable to overcome their disability. They say that they have plenty of determination and yet it seems of no avail.

Determination is of value only when combined with knowledge of the laws by means of which it may be applied to the management and control of subconscious reactions. Whilst the conscious brain is amenable to the laws of argument and reason, the subconscious brain is subject to the laws of the "common path." If it is possible to secure non-interference or inhibition of the conscious brain, the subconscious layers blindly accept any statement made to them. If you say to a subject

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in this condition "Your arm is stiff" the arm becomes stiff, because the conscious brain being temporarily out of action, the subconscious brain blindly accepts the statement. (This was demonstrated in a lightly hypnotized subject.)

The whole difficulty in investigating the phenomena of hypnosis and suggestion lies in the fact that there is apt to be continual interference by the conscious brain. As has already been pointed out, the physician meets this difficulty even in such a simple reflex as the knee-jerk, and the physiologist, in order to get constant results, has to exclude this inhibitory layer by division of the mid-brain or cervical cord. It is clear, then, that great difficulties have to be faced when one attempts to obtain these cerebral reflexes in the intact human subject. Human nature is essentially curious, and the moment an experiment is attempted the subject desires to see what is happening and so tends to bring into action the very layer one is trying to exclude. There is, however, one factor in our favour; that is, the capacity of the human brain of understanding speech both consciously and subconsciously. For this reason the reactions can immediately be obtained, provided the conscious layer is excluded from action. The centres involved at once appreciate the nature of the stimulus, whereas in the case of animals many repetitions are necessary before the subconscious centres appreciate its significance.

Different degrees of suggestion, hypnosis, and hypnotic sleep are distinguished, according to the extent to which non-interference or inhibition of the conscious cerebral centres is produced. Pawlow's work on dogs affords striking confirmation of this. He observed that if the conditioned stimulus be used alone (i.e., without the unconditioned one) after a few repetitions the dog grows drowsy and falls asleep and has to be forcibly awakened to take food. Inhibition is partial sleep. True sleep is a diffuse and continuous inhibition of the hemisphere. The movement of the inhibitory process is slow, and varies widely in different types.

Before discussing the actual methods by which inhibition of the conscious brain may be brought about, I should like to draw attention to a medullary reflex which in many ways represents an intermediate stage between the spinal and cerebral reflexes. Take some snuff or pepper in the palm of the hand and invite anyone to have a good sniff at it. As he does so, say emphatically "You cannot sneeze," and he cannot. (This experiment was then demonstrated.) Sneezing is a reflex act, ordinarily initiated by the irritation of the snuff on the nasal mucous membrane. The message "to sneeze" passes along the fifth cranial nerve to the medulla and thence along the nerves to the various muscles concerned in the act of sneezing. But before this message gets to the effector organ the message "You cannot sneeze" has been sent along the auditory nerve and gains prior possession of the final common path, producing inhibition of the reflex. This experiment never fails if one observes Sherrington's laws in the giving of the inhibitory suggestion, viz.—to make the statement early, emphatically, and to repeat it if any suspicion of a sneeze threatens. We have now to consider in what ways inhibition of the conscious brain may be produced so as to secure an uncomplicated demonstration of the cerebral reflexes constituting the phenomena of hypnosis and suggestion. These methods may be summarized as: (1) Inhibition by psychological methods. (2) Inhibition by means of drugs. (3) Inhibition by means of mixtures of nitrous oxide and oxygen, or nitrous oxide and air.

(1) *Psychological methods* may be rapid or gradual, and consist in taking advantage of temporary distraction of the conscious brain to secure possession of the final common path. The rapid method varies considerably in its immediate success with the type of individual, and also as to whether the habit of inhibition has been previously developed. The gradual method is more certain, and consists in monotonous repetition, as in the case of Pawlow's conditioned stimulus. With patience, success is attainable with practically any subject, and when this is once established the rapid method may be employed.

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(2) The study of conditioned reflexes affords a method of the utmost value for the investigation of the *action of drugs* on the brain, and it is possible that increased pharmacological knowledge will result in the discovery of drugs which will accurately produce the suggestible state without the experience and patience necessary for success by psychological methods. Up to now the drug which promises the greatest assistance in this respect is caffeine. This drug augments all conditioned reflexes, and at the same time diminishes the inhibitory processes. The effect develops in about half an hour and lasts for about a day. I have tried this drug recently in one or two intractable cases, where ordinary suggestion appeared ineffective, and was well pleased with the result. I use the pure caffeine in doses of 2 gr. given in tea or coffee, and repeat the dose in three or four hours if necessary. A special virtue of the prolonged effect of the drug is that it enables the patient to develop auto-suggestion and gradually re-assume control over his own disability. It might conceivably be used for purposes of pre-medication in anaesthesia, but I have not yet used it for this purpose.

(3) By means of *nitrous oxide and air, or oxygen*, a perfectly suggestible state may be produced without loss of consciousness. My own experiments conducted upon myself and my assistants seem to show that the activity of the conscious brain is diminished not by actual lack of oxygen, but by a very gradual process of oxygen limitation. The most highly evolved nerve-cells are more sensitive to the reduction of oxygen than the subconscious centres, and are temporarily put out of action, with the result that perfect suggestion phenomena are easily attainable. This stage occurs during the administration of all general anaesthetics, and the experienced anaesthetist takes advantage of it for the perfect control of his patient during the induction stage of anaesthesia. I have used these mixtures in functional nerve cases where every method of suggestion and psycho-analysis has proved unavailing. With mixtures of these gases striking results were obtained and cures established after six to eight sittings. Up to date these cures are still maintained, though no further treatment has been given for two or three years. Time does not permit of a full discussion of the sub-oxidation theory, but there is one simple experiment which can be performed on oneself with a McKesson machine, which at once brings out the fact that it is not the actual percentage of nitrous oxide which produces these effects, but the way in which this gas enables one gradually to reduce the supply of oxygen to the tissues without actually precipitating asphyxia.

I breathe a mixture of nitrous oxide and air until a perfectly suggestible stage with complete analgesia is produced, whilst consciousness still persists. This mixture varies in different people, but in my own case is about 60 per cent. nitrous oxide, 40 per cent. air, that is, 8 per cent. oxygen. If I now switch the lever over to 80 per cent. nitrous oxide and 20 per cent. pure oxygen, the suggestible stage vanishes and I feel pain when the needle is inserted. If the oxygen be then reduced to about 8 per cent. the suggestible stage returns. There is much more stability in one's sensations when air is used, for the nitrogen acts as a diluent and buffer and guards against sudden changes in oxygen supply. In other words it increases five times the delicacy of the machine in supplying oxygen.

[A demonstration was then given showing the effects of suggestion and hypnosis both by psychological methods and by mixtures of nitrous oxide and air and oxygen.

All degrees of hypnosis and suggestion by psychological methods were shown. Limbs were made stiff, wrist-drop produced and explained, and shell-shock paralyses similarly interpreted. Instantaneous yawning, and recollection of lost memories, were explained.

Anaesthesia and hyperaesthesia were produced and put to practical test by members of the audience. Visual hallucinations and ghosts were produced and

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explained. Two or three subjects were sent into deep sleep by suggestion and continued to snore, oblivious of their surroundings.

Post-hypnotic suggestions were illustrated and explained.

Suggestion phenomena by nitrous oxide mixtures were demonstrated.

Lantern slides were also shown demonstrating the effects of suggestion upon some of the physical functions of the body. By means of polygraph tracings variations in the pulse rate were shown. Accelerations of 25 beats per minute were easily produced, and rapidly returned to normal when retardation was suggested. It did not seem feasible materially to retard a pulse of originally normal rate. The effect of the hearing of different musical pieces on the pulse rate was illustrated, as also the striking acceleration produced by hypnotic hallucinations of pre-historic reptiles.

Charts of salivary secretion were also shown, illustrating the variations of secretion by suggestion during hypnotic sleep. Normal secretion was first collected. Increase was then suggested and the secretion practically doubled. Inhibition was then suggested and the secretion dwindled almost to nothing. To make sure that this was not due to exhaustion of the gland, return to normal was then suggested and promptly occurred.]



Section of Balneology and Climatology.

President—Dr. R. ACKERLEY.

DISCUSSION ON CLIMACTERIC ARTHRITIS.

Dr. R. Ll. J. LLEWELLYN.

My interest in so-called climacteric arthritis is of long standing. Thus, in 1909, when discussing the ætiology of osteo-arthritis, I wrote as follows¹:—

"I have frequently observed in women at the menopause, the subjects of osteo-arthritis of the knees, a peculiar change in the consistency of the skin and subcutaneous tissues, more particularly of the lower limbs. The over-lying skin is usually harsh, dry, and not infrequently scaly, has lost its suppleness, and is with difficulty lifted up from the subjacent tissues, which to palpation feel tense, elastic, and, like the skin itself, much thickened. No pitting is to be observed on pressure, and the physical sign appears independently of renal and cardiac complications.

I have known one instance in which this condition supervened suddenly in the left lower extremity of a woman, who had received an acute fright, during which she experienced a sudden loss of power in the left leg, causing her to fall down; the swelling of the affected limb almost immediately appeared, and was still present when she came under my care some weeks afterwards for osteo-arthritis of the hip and knee of the same side. In this particular instance the limb was considerably increased in size, but in the vast majority of cases it is not so much an increase in size, but an alteration in the consistency of the skin and underlying tissues.

It is in the lower extremities that I have chiefly met with this peculiarity, which may involve the whole of both limbs, and intelligent patients have often commented upon the altered texture of the skin in this neighbourhood. The administration of thyroid substance in some instances was quickly followed by a diminution in swelling when present, and also in restoring a more natural consistency to the affected tissues.

Whether this infiltration of the skin and subcutaneous tissues is identical with the diffuse brawny infiltration noted occasionally by Garrod, in the fingers of patients affected with multiple osteo-arthritis of the hands, I am unable to say. As to its nature one can only speculate; but objectively, at all events, it appears indistinguishable from the solid swelling associated with myxœdema. Its localized distribution forbids our identifying it with this affection, but at the same time we must remember that physicians, following Hertoghe, are learning to postulate the existence of states intermediate between avowed myxœdema, and the normal, 'formes frustes,' so to speak, analogous to the larval forms of Graves' disease, and presumably due to variable degrees of thyroid inadequacy.

That this, in my experience one of the most common forms of osteo-arthritis, should so frequently arise in women at this critical epoch, when the potent influence of the thyroid and ovarian secretions is being profoundly modified or withdrawn from the economy, gives room for reflection.

Taking these facts in association with the extremely insidious onset of the joint changes, their tardy progress and relatively benign character—features more suggestive of a nutritional alteration in the articular structures than a frankly inflammatory process—one is led to question whether some deficiency or perversion in these particular hormones is not in some subtle way etiologically related to this particular variety of osteo-arthritis."

Subsequently, in 1915, in our work on "Fibrositis," A. Bassett Jones and myself, as a result of further study and X-ray examination, affirmed our belief that there were two stages in the life-history of this disorder:—

(1) A primary or pre-osteophytic phase of prolonged duration, whose clinical characteristics are those of villous hypertrophy.

(2) A secondary or terminal stage in which bony and cartilaginous outgrowths make their appearance.

¹ "Arthritis Deformans," pp. 227-229.

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Now it follows that if we are to prevent the development of osteo-arthritis we must concentrate on the first phase of the disorder. For we often encounter cases exhibiting villous arthritis of the knees with variable degrees of hypothyroidism prior to the menopause. In addition, these patients usually display widespread signs of deficient muscular and ligamentary tone, shown by round shoulders, lordosis, sagging abdomen and weak pronated or flat feet. What, then, is the inward significance of this clinical complex?

First, the apparent obesity of buttocks and legs is, in truth, a localized myxœdema and in some this change may be generalized. Again, the laxity of muscles and ligaments is also, I think, due to hypothyroidism: hence my belief that the knee mischief is but a local manifestation of a pre-existing and widespread metabolic disturbance of endocrine origin. It is possible, indeed, that the laxity of muscles and ligaments, and alike the swelling of the synovial fringes, are all due to myxomatous or mucoid infiltration of the connective tissues in these structures.

In support of my contention that deficiency or perversion of the thyroid and ovarian hormones is responsible for this variety of osteo-arthritis, I would cite the following facts:—(1) I have met with this clinical syndrome, not only during the normal climacteric but also when an artificial menopause has been induced by oophorectomy. (2) Again, in a case of acute Graves' disease under my care, the thyroid swelling underwent recession through functional exhaustion of the gland, and arthritis followed. (3) Blake also noted the following sequence: Graves' disease, then myxœdema and osteo-arthritis of both knees and ankles. (4) Pauchet cites an instance of Graves' disease in which partial thyroidectomy was followed by arthritis which improved under thyroid therapy. (5) Deaver, discussing a series of cases of Graves' disease treated by partial thyroidectomy, found that the resistance of the subjects to rheumatism was subsequently lowered.

The foregoing cases, ætiologically speaking, fall into line with the menopausal types, for in Graves' disease also there is not only thyroid but ovarian disturbance. Perhaps the most striking case is cited by Peppo Achioté. A woman, aged 26, suffered from an overgrowth of hair on chin and neck. It was treated by exposure of the region to X-rays, and coincidentally a condition of myxœdema and arthritis developed which relented to thyroid therapy.

Taken collectively these cases afford almost experimental proof that partial thyroid ablation or exposure of the thyroid to X-rays, may, through the hypothyroidism induced, determine the onset of arthritis.

Turning to *endemic goitre*, it is not uncommon to meet with osteo-arthritis in association therewith. Mutch, discussing a series of 200 cases of chronic arthritis, observed: "Minor forms of subthyroidism were very common, while well-defined myxœdema or goitres of considerable size were seen in 14 per cent. of the cases." He adds that thyroid extract was given in all such cases with great benefit to the joints.

It is significant, too, that the incidence of osteo-arthritis in women in this country seems to be abnormally high in regions where goitre is endemic, which is not surprising if we refer the condition to thyroid deficiency. For states of thyroid inadequacy would naturally be more common in such regions.

McCarrison tells me that in the goitrous region of the Himalayas the co-existence in the same subject of goitre and arthritis is so common as to suggest a similarity of origin. It is interesting also to note that osteo-arthritis in women reaches its zenith at the close of the reproductive period. The disorder is much more common in married women than in spinsters. In other words, pregnancy seems to stave off osteo-arthritis. Is this attributable to the physiological increase of thyroid secretion during pregnancy; in other words, a species of autothyroid-therapy?

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In light of the foregoing facts it seems to me that our conceptions of the ætiology of osteo-arthritis must undergo enlargement. In other words, if we submit that osteo-arthritis of the knees in women is of endocrine origin, it follows that all factors—psychic, infective, dietetic or other that make for thyroid inadequacy, may incidentally lead to osteo-arthritis. This, moreover, at any period of life and not exclusively at the menopause, which in some instances may after all be only an aggravating factor, in that it accentuates a pre-existing thyroid inadequacy.

In my opinion, therefore, the disorder under discussion should be regarded as a particular variety of osteo-arthritis, and this only in a purely clinical sense. For though the evidence that it is of endocrine origin is almost conclusive, it does not necessarily entitle us to assume that the disorder is not only clinically but ætiologically distinct from all other varieties of osteo-arthritis.

Moreover, I, like others, have seen instances in women in which not only the knees but the hip-joints, one or both, were also involved, while, of course, Heberden's nodes are frequently associated with osteo-arthritis of the knees. Are we then, in such cases, to infer that the lesions in the hip and the phalanges are ætiologically distinct from the lesions in the knees? Is it not probable, nay certain, that all the lesions hark back to a common ætiological basis?

Again, in osteo-arthritis of the hip in men, do we not frequently meet with Heberden's nodes and often osteo-arthritic lesions in the knees or lumbar spine; and last, but not least, signs of hypothyroidism also?

Do not these facts clearly indicate that it is impossible to effect an ætiological cleavage between osteo-arthritis of the knees in women and osteo-arthritis of the hip in men? Is it not more probable that the same fundamental endocrine factors are responsible for all varieties of osteo-arthritis, and that the differences in localization in men and women are largely determined by static or traumatic factors?

For, viewed as a whole, osteo-arthritis in all its varieties is distinguished by the same characteristics. Its origin is insidious and its course afebrile, while the joint changes are devoid of inflammatory reaction. Moreover, both in hip and knees we see the same sequence of events, primary villous overgrowth and terminal osteo-arthritis.

On these and other grounds I do not think it wise to adopt this term climacteric or menopausal arthritis. For it seems to suggest not only clinical but ætiological differentiation of this variety of osteo-arthritis.

This, I think, is impossible, and, personally, I believe that future research will reveal that all varieties of osteo-arthritis—despite their clinical disparities—hark back to similar ætiological factors, endocrine disturbance playing a fundamental rôle.

Dr. J. BARNES BURT (Buxton).

For many years I have been interested in the condition, called at this meeting "Climacteric Arthritis," but which I have always called hypoglandular arthritis. In 1925 I read a short paper on the subject before the Derbyshire division of the British Medical Association, illustrated by cases at that time in the Devonshire Hospital.

In several text-books and monographs on rheumatism and arthritis written in the nineteenth century, mention is made of the frequency with which arthritis occurs at, or about, the menopause of women (for instance Haygarth, 1805, and Garrod, 1899). The various authors do not appear to suggest that it is a special type of arthritis which occurs at the time, but rather that at this period women are more liable to the ordinary types of rheumatism and arthritis.

Fortescue Fox [1] in a paper read before the Hunterian Society in 1895 actually uses the term "climacteric arthritis," but does not make a separate group of it.

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Burt: *Climacteric Arthritis*

Early in the twentieth century Llewellyn, in his book on osteo-arthritis, under the heading of "Etiology," mentions a possible relationship between the arthritis which occurs at the menopause and faulty endocrine production. This is quoted in Howard Marsh's book on "Diseases of Joints" which came out in the following year. Llewellyn's next book, "Fibrositis," deals very distinctly with most forms of arthritis, but we notice that only two lines are devoted to arthritis occurring at the menopause, and I can find no mention of relationship between endocrine secretion and arthritis.

In 1923 there was a general discussion on rheumatoid arthritis at the Royal Society of Medicine. With the exception of a brief suggestion from Cassidy and Pringle, there is no mention of climacteric arthritis.

Two years ago, Coates [2] read a paper before this Section on the clinical types of so-called multiple arthritis, and definitely mentioned menopausal arthritis as an independent group.

In 1926 Cumberbatch and Robinson [3] suggested that some cases of arthritis were due to deficiency of hormones of the ovary. In the same year Thomson and Gordon [4], in their book on rheumatism, boldly claimed a definite entity for climacteric arthritis.

The following contributions to German literature may be mentioned: (1) An article by Rosen (1917) on "Arthritis of the Climacteric" [5], in which he claims as a separate entity an affection of joints occurring almost exclusively in women at the menopause; (2) a contribution on "Arthritis Deformans of Endocrine Origin," by Fliegel and Strauss [6].

Among French writers I find that M. J. Thiroloix [7] and Mme. Brace-Gillot, in their classification of chronic articular rheumatism, name their fifth group hypoglandular arthritis. They state that no less than 109 out of 160 cases of chronic arthritis belonged to this group. The majority of cases followed the menopause, natural or artificial. Three of the cases occurred in young women with irregular and scanty menstruation. Five cases followed pregnancy and suckling, and this occurrence was due, in the authors' opinion, not to sepsis but to exhaustion of the endocrine gland.

In America (1925) Cecil and Archer [8] published an article on "Arthritis appearing at the Climacteric." This contains the full clinical description of the condition. Most of these articles mentioned are longer than Thomson and Gordon's contribution, but none of them describe the condition so clearly and completely. The chapter they devote to it is one of the most convincing and concentrated pieces of writing which I have come across in any text-book dealing with rheumatism.

It is difficult to understand why so distinct a clinical condition has not been defined before. I suggest four possible reasons.

(1) In the past, the majority of physicians have been content to name these cases osteo-arthritis, because eventually the affected joints develop osteophytes. I imagine that in the Ministry of Health statistics most of these cases were included under the heading of osteo-arthritis.

(2) Villous arthritis as described by Goldthwaite corresponds very closely with the description of climacteric arthritis. As will be remembered, Goldthwaite describes villous arthritis as "traumatic," due to flat-foot, but flat-foot occurs in young women and men without causing villous arthritis. Again, the fact that the joints of the upper extremity may be affected is against the purely static theory. Personally, I believe that climacteric arthritis and villous arthritis are one and the same condition. Coates in his paper makes a distinction between menopausal arthritis and villous arthritis, whilst Llewellyn practically replaces the subendocrine group of 1909 by the term "villous arthritis."

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(3) In women the clinical condition produced by chronic gout may closely resemble climacteric arthritis. Hippocrates long ago noted that gout only occurred in women after the menopause, and undoubtedly the chronic arthritis produced by gout may closely resemble the changes described under climacteric arthritis. More than once a case under my care has been described as climacteric arthritis, when during treatment an acute attack of gout has developed, and on two occasions patients who have been re-admitted to the hospital have been described as cases of climacteric arthritis. On looking up the old notes one has found the diagnosis to have been gout, this diagnosis being based on the fact that the uric acid content of the blood was high.

(4) The conception that all arthritis is associated with some focus of infection, and that climacteric arthritis is merely a special expression of infection at the menopause. It is true that in most of these patients there is some focus of infection, and if all the common area, including teeth, tonsils, and antra, etc., can be eliminated, it is always possible to fall back on the lower bowel as the cause. Typical cases of infective arthritis are found in women at the menopause, and their clinical condition corresponds exactly to those of younger women. Again the excellent results of treatment are against the infective theory.

For the purpose of comparison with other observers, I have analysed the cases of climacteric arthritis under my care at the Devonshire Hospital in the year 1926. They number thirty-three. All developed in connexion with the menopause except four. In these patients the menses were scanty, and there were symptoms of deficient thyroid secretion, such as excessive weight and thinning of the hair. The average weight of the patients was 12·8 st.: the knees were affected in all cases; 24 per cent. had osteophytes in the knee-joint as shown by X-ray; 66 per cent. showed trouble in some other joints at the same time. Two thirds of the cases had some obvious focal infection; 82 per cent. of the cases had flat-foot; in 70 per cent. there was panniculitis on the inner side of the knee, and in 27 per cent. there was panniculitis in other parts of the body as well.

Perhaps the most interesting condition associated with climacteric arthritis is the localized panniculitis situated on the inner side of the knee over the tendons of the semi-tendinosus and gracilis. This form of panniculitis differs from the ordinary form in that there is an excessive formation of fat in the connective tissue. In a certain number of cases this fat forms a semi-defined mass, and may be large enough to suggest adiposis dolorosa. These masses are attached to the skin and move freely over the tendon and bone. They are commonly spindle-shaped, somewhat hard and sometimes painful on manipulation. On squeezing the mass between the finger and thumb, the skin dimples in numerous places as in true panniculitis. Cutting into the mass is like cutting into ordinary fat; the skin is not attached so firmly to the underlying fat as the puckering suggests.

A microscopic section shows much fibrous tissue formation in the subepithelial layer and a large increase of elastic tissue. The increase of fibrous tissue does not appear to pass into the fat below the skin. There are very few round cells present; this may be due to the length of time since the onset of the disease.

The normal plump woman has a small pad of fat over the insertion of the semi-tendinosus tendon, and certain typical cases of infective arthritis show panniculitis on the inner side of the knee; but the combination of panniculitis and pads of fat is an important sign of climacteric arthritis. I now give details of a case which has an important bearing on the subject.

A clinical condition corresponding exactly to that found in so-called climacteric arthritis occurred in a girl aged 15. The girl was a private patient of mine whom I have known for the last thirteen years. In January, 1925, the patient first complained of swelling in both knees at school. I saw her in the following April, the knees were puffy and swollen, there

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Burt—Crowe: *Climacteric Arthritis*

was soft creaking, no other joints affected and no flat-foot. There was some panniculitis on the inner side of the knees. Menstruation began at the age of 14. At the age of 15, following a severe shock, the periods stopped. She was big and heavy for her age, 10 st. 13 lb. I saw her three months afterwards, there was a marked improvement, the periods had returned but were scanty. For those three months she had been taking thyroid. I have seen her frequently in 1926, and the knees are now quite well. The girl is still big and heavy, menstruates regularly (scanty), and shows traces of panniculitis on the inner side of the knee.

Since a clinical condition exactly similar to climacteric arthritis may occur in young girls at the onset of puberty, in young women suffering from symptoms of thyroid deficiency, and in old men, I consider that the term "climacteric arthritis" is not a good one. Various names such as "hypoglandular," "sub-endocrine" and "metabolic" have been suggested. All these words assume that faulty endocrine action is the essential factor; but as everything points to this, there is no objection to a name which accentuates it. Personally, I have always used the term "hypoglandular," and consider that this name covers the essential points. I should like, however, to hear the views of other Members of this Section.

In conclusion, I consider that we have enough evidence to show that climacteric arthritis is a definite clinical entity.

This form of arthritis is always associated with some sub-endocrine condition, and focal infection has no direct relationship with it. It is characterized by synovial swelling of the joints and it is only in later stages of the disease that osteo-arthritic changes develop. The knees are chiefly affected, and there is generally associated with the condition flat-foot and panniculitis, exactly as described by Thomson and Gordon.

When once the general medical public recognize this condition as an entity, much will have been done to clear away the difficulties which surround the nomenclature of the chronic arthritic diseases.

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Dr. H. WARREN CROWE (Harrogate).

I have heard the protagonists on both sides. Dr. Llewellyn, on the one hand, does not agree that climacteric arthritis is a clinical entity, but considers that joint changes frequently occur at the menopause, associated with glandular depression. Many of these cases actually suggest a mild degree of myxœdema. Dr. Burt, on the other hand, would have us believe that women develop a special disease of their own at the menopause—climacteric arthritis. The argument thus seems to centre round the very existence of the disease. Personally, I am disinclined to conceive of all forms of chronic arthritis as being in their essence microbial diseases. In what respect does climacteric arthritis differ from any other form of chronic arthritis? Or what evidence can we adduce that there is such a disease entity? I would venture to submit that beyond the fact that arthritis does frequently develop in women at or about the menopause, and that no doubt endocrine deficiencies may play no mean part in reducing the general resistance, there is neither valid evidence nor any other justification whatever for applying the attribute "climacteric" to any form of chronic joint disease. I have just read Burbank's article in the *Journal of Bone and Joint Surgery*, July, 1926. He has treated some 6,000 cases of arthritis and records his results. He says: "The menopause arthritis, so-called, is in reality only associated with the climacteric because general resistance is low at that period, and in consequence

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bacterial invasion is easy." That is exactly my view. I can see no object in regarding the menopause in woman as other than one of a large number of stresses or strains which encourage arthritis by lowering the natural immunity.

One could with equal force describe influenzal arthritis (arthritis starting after influenza); parturient arthritis (the same after child-birth); financial arthritis (after monetary worry); domestic arthritis (after domestic worry); clerical arthritis (when the disease attacks the poor and ill-nourished clergyman); or clemencial arthritis, if one may so describe that quality of mercy which so often throws an overwhelming strain of sick nursing on devoted relatives. Personally, I can see no object in regarding the menopause in women as other than one of a large number of stresses or strains which encourage the arthritis by lowering the natural immunity.

There are three facts which in my view negative completely the conception of a special disease: climacteric arthritis. The first of these will be obvious to all careful observers. It is that arthritis occurring at the menopause takes different forms. We may get a mild form of synovitis, or a fibrositis in the neighbourhood of the knee-joint, often associated with a long-standing flat-foot. We may get a villous synovitis or an osteo-arthritis of the same joint. And, lastly, we may find an early stage of rheumatoid arthritis attacking ankles, feet, wrists, and hands. Secondly, that the menopause only acts as an added strain may be deduced from the large number of patients with long-standing arthritis, who will state that when the periods ceased the disease progressed more rapidly. Lastly, if climacteric arthritis were a non-microbic disease, then in my own particular field of treatment (by specific vaccines) one would expect to find a fundamental difference in the response. Vaccine treatment should almost provide a method of differential diagnosis, so opposite would be the effect both of individual doses and of the treatment as a whole. Yet as a matter of experience, whether so-called climacteric arthritis arising at the menopause is compared with the arthritis of men of the same age, or of younger or of older men or women, no such essential difference can be detected in either the immediate response or the general result. The nomenclature of arthritis is complicated enough without retaining superfluous terms. I therefore beg most humbly to submit that "climacteric arthritis" be expunged from the medical dictionary.

Dr. F. G. THOMSON (Bath).

If this debate is to be of any value a clear definition of the term "climacteric arthritis" is necessary. Having defined the clinical features of this type of chronic arthritis, it remains to be considered, first, whether we are justified in putting it in a separate category at all, and secondly, whether, if we do so, we are warranted in regarding it as (directly) dependent on or associated with the climacteric.

The main features of the condition I regard as climacteric arthritis, which have been described in a recent publication, are as follows. The condition is one occurring in middle-aged women, and usually confined to the knees, and occasionally to the wrists or metacarpo-phalangeal joints of the thumbs. The patient, who is inclined to gain in weight, complains of gradually increasing stiffness and discomfort in the knees, which becomes additionally painful on exercise, and very frequently so at night. On examination, there is found to be a firm, somewhat elastic thickening of the synovial membrane. The suprapatellar pouch, and the pouches below, and to either side of the patella, are specially noticeable. Crepitation, of a soft, silky character in the early stages, becoming more pronounced but still of a soft rubbing nature, is felt on flexion and extension of the joint, which is usually tender on pressure over the inner side. X-ray examination shows no bony changes in the earlier stages, but may demonstrate a definite shadow corresponding to the thickened synovial membrane. In later, neglected cases, definite

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Thomson—Gordon : *Climacteric Arthritis*

osteo-arthritic changes in the form of osteophytes and lipping of the cartilages may occur.

The condition is essentially one of chronic hypertrophic synovitis, and with appropriate treatment may be confined entirely to the synovial membrane.

Patients afflicted in this way are almost invariably of the hypothyroidic type, with thickened subcutaneous tissues, more particularly above the clavicles, round the loins, and over the upper arms and thighs. Their basal metabolism is usually low, but as patients with typical multiple infective arthritis frequently present a low basal metabolism, this feature is of no value in distinguishing between the two conditions.

The type of case—the stout middle-aged woman, with painful swollen knees, and signs of thyroid deficiency—is no doubt familiar to you all, and is so well defined that I venture to think it merits description, on clinical grounds alone, as a special variety of arthritis.

The question to be decided is whether it may be legitimately regarded as incidental to and dependent on the menopause, or whether it is merely a variety of infective arthritis or osteo-arthritis such as commonly affects the hips, knees or other joints in older people, or lastly, whether it is due to static deformity. Its clinical features differ so widely from those of multiple arthritis due to focal infection, that the latter form of disease need hardly be seriously considered.

The points of difference between climacteric arthritis and osteo-arthritis are hardly less well defined. Whereas typical osteo-arthritis occurs impartially in both sexes in later life, and is characterized by early involvement of the cartilaginous and bony elements of the joint, climacteric arthritis is confined exclusively to women, occurs commonly at an earlier age, is confined for a long period, at any rate, to the synovial membrane, and is much more amenable to treatment. The part played by static deformity, in the form of flat-foot, in the ætiology of climacteric arthritis, is admittedly more difficult to define. A large proportion of these patients undoubtedly suffer from a varying degree of flat-foot, and though this may be only of slight degree, it is a question how far a slight dropping of the arch may be an ætiological factor by imposing strain on the knees.

While flat-foot, often of an extreme degree, is very common among young people of both sexes, more particularly amongst young women occupied as shop assistants, domestic servants, and so forth, I do not think I have ever seen a case of chronic hypertrophic synovitis occurring in such. It is only in middle life, and then exclusively in women, that the "climacteric" type of arthritis occurs; in such the degree of flat-foot is in many cases very slight, and in some it is doubtful whether the arch has really dropped at all.

Therefore, I think there must be some other factor in the production of chronic hypertrophic synovitis in the knees in middle-aged women, and suggest that this, the determining factor, is malnutrition associated with the general somatic changes incidental to the menopause, and that the term climacteric arthritis is therefore justified in the description of this type of disorder.

Dr. R. G. GORDON (Bath).

The question which arises is, can climacteric arthritis be differentiated from infective arthritis on the one hand and osteo-arthritis on the other hand? All forms of arthritis occurring at the menopause are not climacteric arthritis, and the general appearance of the wasted case of infective arthritis is quite distinctive from the robust case of infective arthritis. Further, neither removal of any incidental focus of infection or the exhibition of vaccines has any effect for better or for worse, while the administration of thyroid extract definitely improves the case, and the leaving off of this medication causes definite deterioration.

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Osteo-arthritis does occur as a terminal result in climacteric arthritis, but so it does in infective arthritis, and if we accept the conception that osteo-arthritis is a degenerative disease associated with arterio-sclerotic changes, there is no reason why this should not be so, but it does not prove that osteo-arthritis and climacteric arthritis are one and the same thing.

Climacteric arthritis does not occur exclusively in women at the menopause, and therefore, if it were not such an inelegant word, "hypoglandular" might be a better term to apply to this condition, which does seem to be a recognizable clinical condition.

Dr. A. BASSETT JONES (Whitchurch, Cardiff).

It must, I think, be admitted that, in women, at the menopause we frequently meet with a clinical syndrome marked by arthritis and varying degrees of hypothyroidism. Nevertheless, I venture to suggest that to label the same as climacteric or menopausal arthritis is unjustifiable.

To begin with, the disorder, strictly speaking, does not arise at the menopause, for the primary stage of villous overgrowth often antedates by years the onset of the climacteric. On the other hand, it is during and *after* the menopause that the disease reaches its culmination in the form of osteo-arthritis. In short, villous overgrowth represents the beginning and osteo-arthritis the end result of the disorder. If, then, we are to prevent or control the progress of the disease, we must strive to correct the tendency to villous overgrowth.

Again, if it be admitted that the arthritis is due to thyroid deficiency, it follows that its date of onset will not necessarily be fixed by the time incidence of the menopause, but by any factors that may at any time determine the induction of thyroid deficiency. This being so, it naturally follows that when at the menopause the thyroid undergoes senile atrophy, all the symptoms, arthritic and other, become *ipso facto* aggravated. Attention is thereby arrested and treatment at this late stage is embarked upon. But what should have happened is this: the disease should have been recognized in the primary or villous stage, thus preventing aggravation at the menopause by timely thyroid therapy.

Lastly, there is this further objection to the term "climacteric arthritis," namely, that we get the same sequence in osteo-arthritis of the hip, which is so much more common in men. Here also we see a primary stage of villous overgrowth, often of years' duration, and ultimately osteo-arthritic changes ensue. Moreover, in these men we also meet with signs of hypothyroidism, baldness, dry and thickened skin, increased bulk and often a tendency to high blood-pressure and arterio-sclerosis. How, then, are we to differentiate between osteo-arthritis of the hip in men and osteo-arthritis of the knees in women? I quite agree that in osteo-arthritis of the hip we frequently get a history of trauma. But often the trauma is so slight that one is compelled to conclude that other factors contributing to trophic instability of the joint must have been present in latent form. Accordingly, I think that thyroid deficiency plays a part in the ætiology of osteo-arthritis in men just as it does in osteo-arthritis of the knees in women.

Moreover, I believe that thyroid deficiency exerts its effect through the medium of the nutrient arteries of the joint structures. We know that, in myxœdema, degenerative changes ensue in the blood-vessels, which tend to undergo arterio-sclerosis. We know, too, that osteo-arthritis frequently develops in the victims of arterio-sclerosis; also, that osteo-arthritis frequently follows intra-articular hæmorrhages in hæmophilia.

On the pathological side, Hoffa, Wollenberg, and others have noted the presence of endarteritis obliterans in the articular arteries in osteo-arthritis.

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Now, in view of the salient rôle played by the thyroid and adrenal glands in maintaining vascular nutrition and tone, is it not reasonable to assume that arterio-sclerosis would ensue prematurely in persons living in a goitrous region? It is at any rate noteworthy that the incidence of osteo-arthritis in males in the goitrous county of Lancashire is two and a half times the average. This, as the Health Ministry notes, seems to suggest that in this region men "grow old before their time, just as the death-rates show they die before their time." In support of this the Ministry quotes the Chairman of the National Service Medical Board for Manchester and Stockport as stating, "The average man here is, for military purposes, an old man before he reaches the age of 40." The majority of these osteo-arthritic patients were metal workers—an occupation presumably offering ample scope for trauma.

To sum up, I submit that there is evidence that residence in a goitrous region predisposes to arterio-sclerosis. Also, that this may involve the nutrient arteries of the hip-joints. Failure in nutrition of the bone ends and cartilage follows, and the incidence of trauma determines the onset of osteo-arthritis.

Lastly, in these days we hear much of the prevention and control of osteo-arthritis, and I would emphasize the importance of early recognition and timely treatment of the disorder in the villous stage. In this way only can the evolution of the disorder be checked and the formation of bony outgrowths be prevented.

The removal of infective foci is of secondary importance compared with the early correction of static defects by orthopaedic measures. Coincidentally, the body weight, if abnormally high, should be corrected by restriction of carbohydrates and the exhibition of thyroid. Other helpful measures are faradism and massage, especially of the vasti interni muscles, so as to counteract laxity of the joint capsule, supplemented by local hot-air baths and ionization of the affected joints to promote absorption.

Dr. C. W. BUCKLEY (Buxton).

Climacteric arthritis is simply chronic villous synovitis at the onset set up by trauma of a slight and long continued kind, often merely ordinary wear and tear, affecting joints the resistance and reparative capacity of which are reduced by the action of that disorder of the endocrine system which, in greater or less degree, occurs at this epoch. A similar reduction of resistance is a factor in the causation of osteo-arthritis of the hip, in this case probably owing to arterio-sclerosis, but since the disease characterizes the period of decline of the sexual powers it is probable that an endocrine factor also plays a part, but is different in nature, since the panniculitis met with in cases of climacteric arthritis is not found in men with osteo-arthritis of the hip. Holding this view I naturally do not believe in the use of vaccines in these conditions, and I have recently seen a striking example of their futility in a patient who after three courses of an autogenous vaccine was no better, but whose condition improved very strikingly on thyroid administration, this improvement being maintained. I have investigated 1,000 cases of rheumatic disease in men, admitted under my care in the Devonshire Hospital, Buxton, in the last two or three years, and have found only fifteen cases of chronic villous synovitis. Of these, ten patients had septic conditions of the teeth and gums, a proportion probably not greatly different from that which would be found in a similar number of men of the same age and social station chosen at random. Ten patients had flat-foot and one had genu valgum, and it is of interest to note that knock-knees, which are so frequently met with in women, may be a factor in the production of this form of arthritis from the abnormal stresses which they set up in the knee-joints.

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Dr. VINCENT COATES (Bath)

said that in the study of such a condition variously described as hypoglandular arthritis, menopausal arthritis, or climacteric arthritis, it was a happy inspiration to have invited members of the Section of Medicine to attend, since physicians at spas were perhaps inclined to concentrate their attention too intensely on joint conditions at the expense of general medicine, while physicians elsewhere rarely saw an aggregate of joint conditions. He proposed to advance no new facts perhaps, but facts in such a combination as to present a wider conception of the clinico-pathological entity under discussion. He could not conceive it possible that it should have escaped notice that there did occur at the menopause a form of arthritis which differed from other types of rheumatoid arthritis common at this as well as at other age periods.

He would not discuss the bibliography as this had been most thoroughly done by Dr. Barnes Burt.

Taking the aetiological and clinical features together he would point out that there was a definite group of women between the ages of 45 and 55 who complained of stiffness, pain, and an occasional swelling in the knee-joints. In these cases the following features were found in varying degree.

(1) *Stigmata of Hypothyroidism*.—(a) *Gross*: Loss of hair, increase of weight, dryness of the skin and inability to sweat, scanty or absent periods, increased sensibility to cold. (b) *Minor*: Constipation, dental caries, cracked lips, girdle obesity, eyebrow deficiency.

(2) *Static and Degenerative Factors*.—Flat-foot, knock-knee, pendulous abdomen, lordosis, Heberden's nodes.

(3) *Infective Processes*.—Usually mild.

The *knee-joints* in the first stage had pads of fat about them, especially on the internal aspect of the tibiae and about the quadriceps bursa. There was synovitic creaking and occasionally effusion. In the second stage there was sometimes a fusiform swelling, and upon acupuncture a small quantity of gelatinous fluid might be emitted. In the third stage there was well-marked bony lipping.

[Dr. COATES showed radiograms illustrating the close approximation of patella to femur as described by him on January 14, 1925,¹ presumably due to lack of synovial fluid, and complete osteo-arthritis of the same knees in the same case eight months later.]

The pathology of the joints could only be surmised from the clinical and radiological findings. The iodine metabolism was responsible for the internal oxidation of tissues. Failure of this led to (a) fatty infiltration and degeneration, or (b) myx-œdematous degeneration. It would not, therefore, be unreasonable to suppose that these were the changes which took place in such joints, especially since joints, being subjected to more stress than many other parts of the body, would require an especially efficacious gaseous exchange and be unduly susceptible to suboxidation.

However, the condition of the joints just described, certainly in the earlier stages, was by no means confined to women and the climacteric, and it was by the study of other metabolic disorders that a true appreciation of this hypoglandular arthritis was reached.

He (Dr. Coates) thought it would be sufficient to take the symptom complex of thyro-pituitary failure to illustrate this point. Thyro-pituitary failure occurred in various states:—

(i) *In advanced physiological states* in a modified form; as, for example, after childbirth when an enlarged thyroid was often noted (witness almost any well-known painting of the Madonna), and often definite girdle obesity.

¹ *Proceedings*, 1925, xviii (Sect. Baln. and Clim.), pp. 13-16.

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(ii) *In pathological states:* (a) Pituitary obesity with thyroid failure in children; (b) thyro-pituitary failure following syphilitic periostitis of the sella turcica; (c) thyro-pituitary failure in a (presumably) congenitally susceptible individual following a chronically infected gall-bladder.

All of the above types had come under his (Dr. Coates's) personal observation.

The clinico-biochemical features of thyro-pituitary failure were the following: (1) general and girdle obesity; (2) an abnormal sugar curve; (3) a lowered basal metabolic rate; (4) occasionally a special form of arthritis.

Dr. COATES then showed photographs of:—

(a) A girl, aged 11, who came under his care for pains in the knees; illustrating early girdle obesity, advanced sexual characteristics, pituitary fingers and knees with panniculitis.

(b) A woman in the twenties, complaining of stiffness and pains in the knees, with an acromegalic facies, an enlarged sella turcica (X-ray shown), girdle obesity and typical menopausal knees.

CONCLUSIONS.

In certain instances, in cases of artificial menopause, natural menopause and thyro-pituitary failure, there were the following common findings: (1) obesity, general and girdle; (2) a derangement of the sugar storage mechanism; (3) a lowered basal metabolic rate; (4) a special type of arthritis.

It would seem, therefore, that endocrine imbalance was the common denominator in certain disorders as stated above; infective processes occurring *initially*, and the end result being thyro-pituitary failure. Whether this order was reversed or not in climacteric arthritis or even whether infection played any part he was unable to say. In his opinion, the term "hypoglandular" arthritis was to be preferred to "climacteric."

Dr. J. F. HALLS DALLY.

I agree with those speakers who have urged the importance of the endocrine factor in the production of so-called "climacteric" arthritis. "Hypoglandular," suggested by Dr. Burt, goes much further in recognition of what I believe to be the basic ætiological factor, but in my judgment does not cover the whole field, and I would rather suggest that the term *endocrine* be employed to describe the series of cases under discussion arising at any age. "Endocrine arthritis" would thus agree with the consensus of opinions already expressed, and would not limit the outlook as does the word "climacteric."

We are indebted to Dr. Llewellyn for his masterly presentation, in 1909, of the general and local clinical features of such cases, as well as to Dr. Thomson and Dr. Gordon for their further valuable and detailed observations. The lowered basal metabolism, to which Dr. Coates has referred, forms an integral part of the picture. Dr. Warren Crowe's remarks I regard as applicable only to arthritis of infective origin. While in certain instances of endocrine arthritis infections may undoubtedly take place, I can only regard such as being secondary and incidental. If from the intestines of arthritic subjects serum-resisting *Bacillus coli* and serum-resisting streptococci can be isolated in pure culture, definite indications then exist for autogenous vaccine therapy, but I strongly deprecate a hit-or-miss principle in vaccine administration on the alleged ground that it cannot do harm and may do good. The experience of many observers, including my own, does not in this respect accord with Dr. Warren Crowe's views.

If one studies the writings of that great clinician, Charcot, on the subject, one finds that throughout he only recognizes "different forms of one and the same disease," and just as one obtains a clearer view of tuberculosis by recognizing the essential unity of its varied manifestations, similarly I would like to stress the

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essential unity of the anatomical changes which take place in these chronic joint affections under discussion, from the early villous and synovial forms up to the degenerative osseous changes which occur as an end-result in advanced osteo-arthritis.

If climacteric arthritis be taken to mean arthritis arising at or about the time of the menopause, to this statement there could hardly be any objection. In fact, a certain parallelism may be cited in climacteric hyperpiesia or climacteric obesity, lack of endocrine balance being in each case responsible mainly for inception. If, however, as I gather, an attempt is being put forward to separate out a particular type of arthritis, and to claim that the onset of the menopause induces such special type, my own view is that this classification is a purely artificial one.

I object to the term "climacteric arthritis," for no anatomical differentiation is possible between chronic arthritis of the knee-joints and of the hip. As is well known, hormonal disturbance may occur at various ages. Nature does not work in watertight compartments, and, if one contends that an endocrine element is responsible for the production of arthritis in women, it is possible, nay probable, that the same factor intervenes in the case of men. Arthritis in women not infrequently precedes the menopause, and depends mainly on hypothyroidism at whatever age induced. Also, one should not forget that hypothyroidism is usually correlated with changes in the arteries, as in myxœdema, or that osteo-arthritis of the hip often occurs in arteriosclerotic men in whom the nutrition of the joint is impaired (*morbus coxæ senilis*). Moreover, may I remind you that states of hypothyroidism connote suboxidative tendencies, and thus the orderly chemical changes which normally take place in growth and absorption of bone may be hampered and modified, in this way becoming chaotic instead of regular. Tissue alterations necessarily occur with resultant atrophy.

To proceed a stage further by labelling arthritis of the menopausal epoch as a "disease entity" is even more unsound. A "disease" is a purely mental concept, for, as Crookshank pointed out in the last Bradshaw Lecture: "No disease is a discrete object of perceptual experience." Hence a "disease entity" has no existence. For these reasons I hold that we should be wiser not to labour attempts at classification unless some definitely good and useful purpose is thereby achieved.

DR. H. A. ELLIS.

I am glad that this discussion on climacteric arthritis is taking place, because it implies a general recognition that in at least one form of arthritis the causation is metabolic. If this be so in one case, why not in others? My recent investigations have shown that arthritis is fundamentally a metabolic disease, the form it takes depending to a large extent on the particular constitutional metabolism of the person attacked. Now there are two forms of constitution associated with two entirely different sorts of chronic rheumatic disease of the joints, and these conditions can be recognized with complete accuracy by analysing the acid elimination of the urine. Acid occurs in the urine in two forms—as free acid (principally phosphoric) and as acid in combination with ammonia. This latter combination is excreted in a neutral form, but the acid can be released by adding formalin, so that urotropin is formed. It is then possible to estimate the "combined acid." A definite ratio exists between the amount of free and of combined acid. In average persons we find about 1 of free acid to 2 of ammonia-combined acid. Variations may occur on either side of this average ratio. We may find an approximation to equality between the two forms. This is associated with a definite constitution which, on account of its relative acidity, I define as the acid constitution. On the other side the ammonia-combined acid may exceed the free acid by 3 or more to 1. The constitution associated with this ratio is defined, on

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account of its deficiency in free acid, as the alkaline constitution. Such a constitution will always be found associated with difficulties of nutritional assimilation. The organism lacks, or cannot utilize, the necessary materials for the formation of acids. On the acid side of the average ratio (where the figure is in the neighbourhood of 1 to 1) the difficulty occurs in the elimination of the products of acid metabolism.

Now these two forms correspond to two completely different types of arthritis. The alkaline type I would call metabolic deficiency arthritis. This is what is often described as *arthritis deformans*, or septic arthritis. It is characterized by similar malformations on both sides, commencing usually in the smaller joints. The deformities, when they are at all advanced, take on the character of dislocations—the sort of dislocations produced in hemiplegia as flexor dislocations, and due to the fact that the flexor muscles are nearly always more powerful than the extensors when the degree of stimulation is equal. This condition is essentially of trophic nervous origin. There is an acute wasting of the muscles, unconnected, or only partially connected, with the joint injuries. There is also an atrophic velvety skin, especially on the palms of the hands, and there is a mask-like face, due to the muscular paralysis usually present in these cases.

The other form, which may be described as metabolic excess arthritis, differs considerably, not only in distribution, but in characteristics. It is largely peri-arthritis, with bony nodules developing and the ultimate destruction of the cartilage, with a proliferation of the bone cells round the joint. This is really the osteo-arthritis variety of rheumatism.

How far both these constitutional conditions can be activated by septic organisms is at present uncertain. There is no doubt that focal infection is one of the main activators of rheumatism in the alkaline type, because this type has a naturally deficient resistance to all septic conditions. In the acid type I very much doubt whether sepsis plays any considerable part. This arthritis seems to be dependent largely on a retention of the ordinary metabolic residue, through deficient elimination. It suffices for my purpose that these two rheumatoid forms can be easily differentiated by urinary analysis, since no mistake can possibly be made between cases with a 1 to 1 ratio and those with a 1 to 3 ratio, and as the condition indicated by this analysis entirely controls treatment, this investigation should always be made. The treatment in each case differs entirely from that which is beneficial in the other.

I believe that ultimately rheumatism will be classified along these lines, and we shall have as a primary distinction four metabolic conditions: (1) an alkaline rheumatic diathesis; (2) an acid rheumatic diathesis; (3) an endocrine deficiency diathesis, which is what we are discussing this afternoon in association with the climacteric; (4) the uric acid variety or true gout.

I append two or three urinary analyses of cases to show that no possibility exists of a mistake, in at least some of these cases, as to which class they belong.

		Titratable acidity		NH ₃ combined acid	
			c.c.		c.c.
C.L.—Rheumatic metabolic excess	...	{ 4.30 a.m.	...	25	38
		{ 8.30 a.m.	...	20	28
S.T.P.—Rheumatic metabolic excess	...	{ 8.30 a.m.	...	48	52
		{ 9.45 a.m.	...	62	52
		{ 9.50 p.m.	...	44	40
C.B.—Rheumatic metabolic deficiency	...	{ 7 a.m.	...	0	14
		{ 9 a.m.	...	0	22
		{ 11 p.m.	...	0	6

Note.—The numbers refer to the amount of decinormal soda necessary to neutralize 100 c.c. of urine,

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Dr. S. W. PATTERSON (Ruthin Castle, N. Wales).

The pathological changes of non-specific arthritis are similar in male and female, young and old, in the early stages, consisting of atrophy of the articulations and rarefaction of bone, followed later, probably as the result of mild trauma, by hypertrophic changes. The onset in women has tended to be in the smaller joints of hands and feet, in men spondylitis has predominated. The changes are explicable as due to a varying interplay of an infection with the bodily reaction; but a case has been made out for a special form of arthritis due to endocrine deficiency. Whether this is in the nature of a degeneration (arthrosis), or of a mild degree of infection, is at present an open question. In forty-five cases of arthritis starting about the climacteric there has been found in all an infective basis requiring attention to teeth, tonsils, antra, appendix, gall-bladder, cervix uteri, colon (including diverticulosis), chronic bronchitis or pyelitis.

Dr. W. P. KENNEDY (Bath).

Dr. Llewellyn assumes that climacteric arthritis is a definite instance of the effect of thyroid insufficiency at the time of the menopause, and results in a primary overgrowth of the villi of the synovial membrane of the joints, of a myxomatous nature, I consider the primary change may commence in the cartilage, and extend to the other structures of the joint, the villous overgrowth being of a secondary nature.

Climacteric arthritis coincides with a lessened harmonic stimulus to vitality when the natural stimulus from the gonads is on the wane and *all* the ductless glands, including the thyroid, become enfeebled and nature's general defensive power against infection as a sequence suffers.

All those glands evolved from the Wolffian bodies are the most effective source of tone and energy, and it is at the time of the climacteric that this natural stimulus begins to fail.

Dr. PRESTON KING (Bath)

agreed with those who said there was no such thing as climacteric arthritis as a separate disease. He mentioned that the late Dr. Spender had drawn attention to what he called the later forms occurring at the menopause. Cases of this so-called disease derived benefit from the waters at Bath together with the administration of thyroid gland. X-rays did not distinguish this particular form of arthritis from that occurring at any age and in either sex.

Dr. M. B. RAY.

This discussion practically resolves itself into a question of the classification of rheumatic diseases.

It must be remembered that all classifications are purely artificial and have no rigidity, neither have they any validity outside our own minds. They simply enable us to distinguish and record certain sequences of phenomena which regularly recur in the limited ambit of our experience. A system of classification is a good servant but an uncommonly bad master. When once we begin to think of diseases as clinical "entities" and as capable of being regarded in much the same way as botanical specimens, confusion becomes more confounded. A disease is ultimately a disorder of function, although it may be, and usually is, expressed in terms of anatomical changes. The disordered function is the disease, not the tissue changes that bring it about.

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It is obviously impossible to discuss any medical subject without having recourse to a nomenclature of some kind and so long as this important fact is kept constantly before our minds any terminology we like to adopt for descriptive purposes is perfectly valid. If therefore we like to describe a disordered functioning which is apt to occur at a certain period of life, what possible objection can be made? We know that headaches are extremely common among women at all times, and no one would dream of objecting to the designation "menstrual headache." I, for one, would welcome the addition of all the categories mentioned by Dr. Warren Crowe. They all indicate disordered functioning and they also associate the cause with the terminology, which from a descriptive point of view is distinctly helpful.

I would conclude my few remarks by quoting the saying of Sigaud, viz., "Disease is a dissociation of the functional unity of the organism."

Dr. E. P. CUMBERBATCH.

During the past five or six years a large number of cases of arthritis of various types have been treated by diathermy on somewhat novel lines in the Electrical Department of St. Bartholomew's Hospital. The experience that has been gained there has compelled my co-worker, Dr. Robinson, and myself to conclude that there is a type of arthritis closely associated with, if not entirely due to, disturbance of the endocrine function of the ovary. Our reasons for this conclusion are the following: (1) Some of the cases occurred in young women in whom the menstrual function was being established. They developed arthritis of the rheumatoid type, and amenorrhœa occurred. There was no evident primary focus of infection. The application of diathermy to the interior of the pelvis brought the arthritis to an end and menstruation returned. (2) Other cases occurred in women at the other end of menstrual life. In many the climacteric commenced at an early date and menstruation ceased. In these, again, there was no evident primary focus of infection. The application of diathermy usually arrested the arthritis and menstruation recommenced in the cases in which the onset of the climacteric was premature. In one case a menstrual period occurred after an interval of ten years. In another case the interval was three and a half years.

Dr. Robinson will give the particulars of some of the cases.

Dr. F. R. SAWDON (Tiverton).

In supporting the nomenclature of this disorder as propounded by Dr. Burt, it seems to me to be the only appropriate one.

With regard to Dr. Warren Crowe's attack on any causation other than an infectious one I do not agree, after a long experience of this class of complaint. I suggest for your consideration the fact that Jewesses are rarely sufferers from infective rheumatoid arthritis as we know it. On the other hand they suffer from hypoglandular arthritis to no small degree. We know their racial predisposition to glycosuria as opposed to what is seen in Gentiles, and it makes one wonder whether there is not some constant endocrine disturbance present.

The previous speaker referred to his experience of electrical treatment in this disease, and I will cite one of my cases of interest which well I remember.

Erlanger's deep X-ray treatment had been performed for uterine fibroid which was successful. Twelve months afterwards, the onset of artificial menopause produced well marked symptoms of hypoglandular arthritis. The sudden "going out of commission of the ovaries" might have some endocrine significance.

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Dr. C. A. ROBINSON.

For some years now, in the electrical departments of the West Middlesex Hospital and of St. Bartholomew's Hospital, certain cases of arthritis have been treated by diathermy so applied as to heat the pelvic organs.

There can be no doubt that many cases of arthritis occurring about the time of the menopause are due to infection of the cervix. In these cases there is a definite cervicitis which may or may not be gonococcal in origin. Cure of the cervicitis by diathermy results in arrest of the inflammation of the joints, and if their pathological condition has not advanced too far the result may with justice be called a cure.

The method of applying diathermy to free the cervix from infection is distinct from that used for heating the pelvic organs as a whole. During this work it has been found that in suitable cases benefit resulted from diathermy so applied as to heat the pelvic organs. It was further observed that in these cases there was no evidence of infection of the cervix. On the other hand, it could be concluded from the clinical evidence that there was deficiency of ovarian internal secretion. This has been found to be true of arthritis occurring at all times after the commencement of menstrual life. It appears, therefore, that although the name climacteric or menopausal arthritis may with some reason be applied to many of the cases, it is not applicable to all of this class.

Cases of arthritis in young women whose menstrual periods have begun normally and have been followed shortly after by a time of amenorrhœa, have resulted in complete functional restoration of the joints by heating the pelvic organs through diathermy. Later on in life, that is after the age of twenty-eight years, cases have occurred in which arthritis has been associated with obesity and other signs of ovarian inactivity. These cases also have been benefited by diathermy so applied.

That benefit may result from this method when there is no infection of the cervix and uterus is shown by the good results obtained from it in the case of a woman of 52, whose uterus, including the cervix, had been removed fourteen years previously. She made a remarkably rapid and complete recovery.

The greater number of cases that have been successfully treated have occurred at the time of the climacteric, but some of them have been of the period comprised between ten years before and ten years afterwards. In the case of some of those patients in whom the menses had ceased for periods up to ten years, menstruation recurred as a result of the treatment.

Those cases which have benefited are not differentiated by a syndrome which is peculiar to them. All the anatomical lesions and clinical manifestations of arthritis deformans are represented. Cases which would be classified as rheumatoid arthritis, osteo-arthritis, spondylitis and villous synovitis have been encountered. X-ray examinations have shown atrophic and hypertrophic types. Loss of cartilage and rarefaction of bone or osteophytic new bone formation may occur, or these two conditions may be present together in the same joint.

The hypothesis is that the arthritis is directly or indirectly due to inactivity of the corpora lutea of the ovary. This inactivity may occur at any time after puberty, and may or may not be associated with absence of menstruation. Heating the ovary by diathermy increases the activity of the ovarian functions.



Section for the Study of Disease in Children.

President—Dr. J. D. ROLLESTON.

CASES.

Congenital Syphilis.

By HAZEL H. CHODAK GREGORY, M.D.

PATIENT, female, aged 13 years.

History.—Full term, breast-fed. Said to have been a healthy baby. No trouble till seven years old, when she "was almost blind" for about a year. Measles and pneumonia at eleven. Frequent colds. Came under observation during an attack of diarrhoea last summer.

Family.	F. 21	Premature	Premature	Patient	F. 11	M. 8
	healthy	still-birth	still-birth		healthy	healthy

On Examination.—Typical picture of congenital syphilis. Stunted growth. Notched incisors. Evidence of old interstitial keratitis and iritis. Abdomen: Large, hard liver with irregularly bossed surface, edge $4\frac{1}{2}$ in. below costal margin. Spleen enlarged and firm. Slight general enlargement of glands. Urine, nothing abnormal discovered. Knee-jerks sluggish. Blood-count: Red blood-cells 4,650,000; white blood-cells 11,000; hæmoglobin 70 per cent.

Wassermann reaction strongly positive.

Rickets.

By HAZEL H. CHODAK GREGORY, M.D.

PATIENT, male, aged 3 years 6 months.

History.—Full-time, breast-fed till ten months old, then mixed diet. First tooth at twelve months. Could not walk at two years. No acute infectious diseases.

Home Conditions.—Top floor. Visitor reports poverty, neglect and dirt. Baby brother has rickets also.

On Admission.—Marked rachitic changes in the long bones, with much antero-posterior and lateral deformity, enlarged epiphyses and general stunting. Changes not so marked in the head bones as in the long bones. Teeth carious. Muscles flabby, but patient can walk. Spleen enlarged and firm. Urine: No albumin; urea concentration satisfactory. Blood urea 0.029 per cent. Blood phosphorus: Total acid soluble P = 4.04 mg. per 100 c.c. serum; inorganic P = 3.69 mg. per 100 c.c. serum.

X-rays.—(1) Early December. Skiagrams show active rachitic changes in long bones, bending of the shafts, spreading and cupping of the ends of the diaphyses, enlarged "woolly" epiphyses. (2) Mid-January. Some improvement shown. Definite firm lines are appearing in the epiphyses.

Treatment.—Cod-liver oil, ultra-violet light, massage and splints. Case shown for unusually active severe rickets for the age. Query as to duration of the disease.

Discussion.—Dr. KINGSTON BARTON said that in the January issue of the *Johns Hopkins Bulletin*, the rapid effect of the intramuscular injection of concentrated cod-liver oil on bony rickets was described. Cure was reported in some two to three weeks, and after the third

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injection the radiograms showed great improvement. He (the speaker) suggested that that remedy should be tried in the present case. The injection must be intramuscular, not subcutaneous.

Mr. R. H. A. WHITELOCKE said that at present he did not see much hope for this patient from operation.

Megalocolon.

By DOUGLAS FIRTH, M.D.

BOY, aged 5 years. First seen on January 4, complaining of vague pain and constipation, and admitted January 6.

History.—Present abdominal enlargement noticed three weeks previous to admission and associated with constipation, bowels acting two or three times a week with occasional abdominal pain. There was no nausea or vomiting, but some loss of appetite. Two months previously there was a similar attack, which was treated at home. The child is said to have always had a large stomach.

Past History.—In-patient from February 2 to 21, 1922, at age of 5 months, for right inguinal hernia. Operation by Sir Herbert Waterhouse. There was no history of constipation or any abnormality.

Family History.—Third child of healthy family of four.

On Examination.—Well-grown boy, with large distended abdomen and splaying of the costal margin. Circumference of abdomen, 26 in., not appreciably altered during treatment. Percussion note resonant. No dullness in flanks. Stools have not been constipated since admission, but have been normal in appearance.

X-ray Examination.—Opaque meal and opaque enema. Stomach: Nothing abnormal detected. Colon: Megalocolon, no obvious obstruction; some stasis in pelvic colon and rectum at forty-eight hours.

Minor Manifestations of Congenital Syphilis ; Three Cases.

By W. G. WYLLIE, M.D.

R. AND N., twins, aged 9 years.

History.—One of the twins, N., was brought to Maida Vale Hospital for Nervous Diseases because he had been stuttering for several years. He was stated to be a nervous, excitable child and left-handed, except for writing, although no relatives had been left handed. R., the other twin, was stated to be healthy.

Family History.—The father contracted syphilis twenty years ago, and later both parents had secondary manifestations.

Examination.—The disparity in growth between the twins is considerable. N., the smaller one, stutters and is left-handed, but shows no physical signs pointing to syphilis of the nervous or any other system. The Wassermann reaction is negative in the blood.

R. is taller than N., and beyond slight inequality of the pupils (right greater than left), has no other signs of disease of the nervous system. The Wassermann reaction in the blood is of the diffuse, weakly positive type associated with congenital syphilis. Mentally the twins are well up to their standard at school. The father's pupils react briskly and the knee-jerks are active.

I. A., aged 10 years, schoolgirl, suffered from headache for two months previous to December, 1926.

Examination.—Physical examination reveals no defects in any part. The discs, pupillary reactions and tendon reflexes are all normal. Her intelligence is unimpaired. The child is the average height for her age (52 in.).

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Inquiry into the family history reveals the fact that the father has tabes and optic atrophy. There are two other children in the family besides patient, both stated to be healthy.

The Wassermann test in the blood of this patient gives the weakly positive diffuse reaction, which is often found in congenital syphilis.

The interesting point about these patients is that they have scarcely any physical signs of ill-health, and such as they have are not specially related to syphilis. Yet the Wassermann reaction shows them to be cases of congenital syphilis.

I presume antisyphilitic treatment would do them good, and would possibly avert congenital tabes or paresis in later life.

Discussion.—Dr. NEILL HOBHOUSE said that a year ago, he (the speaker) had shown before the Section a case of congenital general paralysis of the insane in a very early stage. The patient in that case had done very well under sulfarsenol, much better than did most cases of neuro-syphilis of congenital origin which he had seen. With regard to the stammering, had efforts been made to compel the child to use the right hand; he (Dr. Hobhouse) doubted whether there was any relation between stammering and left-handedness, *per se*. The stuttering might be due to misguided attempts to make the child right-handed.

Dr. E. STOLKIND said that one of the twins was a nervous child, but the stammering and the left-handedness had no direct relationship with hereditary syphilis. The antisyphilitic treatment would not cure the stammering. The taller boy seemed to be healthy (beyond slight inequality of the pupils). It was interesting to note that of these twins as in many others previously observed, one had a positive, whilst the other had a negative Wassermann reaction. The girl, aged 10, seemed to be healthy, as was stated to be the case with the two other children, aged 21 and 4 years, respectively. The father was infected with syphilis 23 years ago, and the mother had had signs of late "secondary syphilis," i.e., a gummatous syphilide of the soft palate 18 years ago. In one of his (the speaker's) cases the Wassermann reaction was positive in the father and the middle child, and negative in the mother and the two other children. In some other cases a positive Wassermann reaction was found only in the eldest or only in the youngest child. Untreated syphilitic parents could bear healthy children, especially five years after infection, a longer period giving more chance. In one of his papers on syphilis of the circulatory system he (Dr. Stolkind) had pointed out that in some of his cases the Wassermann reaction was at first negative for a long time, but later, either after specific "provocative" treatment or *without* any treatment, it was found positive. The same applied to hereditary syphilis. In some cases of syphilis the Wassermann reaction had been repeatedly negative; in others it had remained positive in spite of prolonged treatment. In some cases with a positive Wassermann reaction no macroscopical lesions typical of syphilis could be discovered at the autopsy. A positive Wassermann reaction, i.e. (1) *strongly positive*, and (2) the test having been made by an *expert*, indicated as a rule only that the patient had had a syphilitic infection; in the same way as a positive tuberculin reaction showed only that somewhere in the organism a tuberculous focus (active or inactive) existed. It was as yet not proved that a positive test could indicate that the spirochaetes were active in the patient. Even a repeated negative test did not demonstrate that the patient was cured. It was essential to emphasize the fact that spirochaetes remained in the organs—heart, aorta, brain, etc.—in spite of a prolonged antisyphilitic treatment.

If a child born of syphilitic parents was quite healthy all his life with no evidence of syphilis, then he (Dr. Stolkind) saw no necessity for specific treatment, even if the Wassermann reaction was positive. In cases with definite stigmata the treatment should be a cautious one.

Dr. PARKES WEBER asked whether Members made it a rule to have the Wassermann reaction taken in the parents and brothers and sisters of congenitally syphilitic children (when ever possible), and when the reaction was positive did they always insist on methodical antisyphilitic treatment? The question was a grave one, because of the possible later occurrence of severe interstitial keratitis or juvenile general paralysis in children who were apparently

¹ *Medical Press and Circular* (a), 1921, cxi, p. 414; (b) *ibid.*, p. 9; (c) p. 105; (d) p. 167, and (e) p. 368. *Brit. Journ. Child. Dis.*, 1920, xvii, p. 126.

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healthy but in whom a positive Wassermann reaction showed the presence of latent congenital syphilis. The Wassermann reaction, of course, was not always positive in cases of congenital syphilis.

Dr. E. A. COCKAYNE said that the safe course would be to treat these cases as examples of congenital syphilis. The chances of untoward results from treatment were few, but if such cases were not treated the risk of some lesion developing later was considerable.

Dr. R. C. JEWESBURY said that in the special department at St. Thomas's Hospital for the treatment of children suffering from congenital syphilis the Wassermann reaction had sometimes proved unreliable in the case of very young children; and he (the speaker) did not think much importance could be attached to this test during the first three months of life. After that age, however, if the technique employed was correct—a very important matter—the Wassermann reaction could be regarded as a very valuable test of syphilis in the child. When the reaction was positive, the rule followed at the St. Thomas's Hospital clinic was to give mercury for two years with two or three courses of six injections each of sulfarsenol. In a certain proportion of the children the effect of this was to render the reaction negative; in another proportion the positive reaction was less emphatic than before, while others showed no effect from the treatment. If the Wassermann reaction was positive the right course was to treat the child for syphilis, even though there were no physical signs of disease.

Dr. PARKES WEBER said that a long time ago he (the speaker) had seen a boy who had severe interstitial keratitis from previously latent congenital syphilis. The father had died from general paralysis of the insane. In both this boy's sisters, who were younger than he was, the Wassermann reaction was positive; they both had latent congenital syphilis. Antisyphilitic treatment was given them all, but later on one of the sisters developed interstitial keratitis in spite of her treatment, though it (the interstitial keratitis) was of shorter duration and less severe than in the case of her brother, who had not been treated before it developed.

Dr. WYLLIE (in reply) said he did not know whether the stuttering or the left-handedness had begun first. The mother had tried to cure the left-handedness by compelling the child to write with the right hand. In reply to Dr. Weber, he (the speaker) believed that every physician had his own rule about treating the parents of such children. His (Dr. Wyllie's) custom was to test the blood of all the other children in the family and that of the parents, too, if they were willing to come, but he did not use any coercive measures. These children were now having arsenical injections, which would be followed later by mercury and iodide medication.

Hæmangiectatic Hypertrophy of the Arm.

By C. C. BEATTY, M.B.

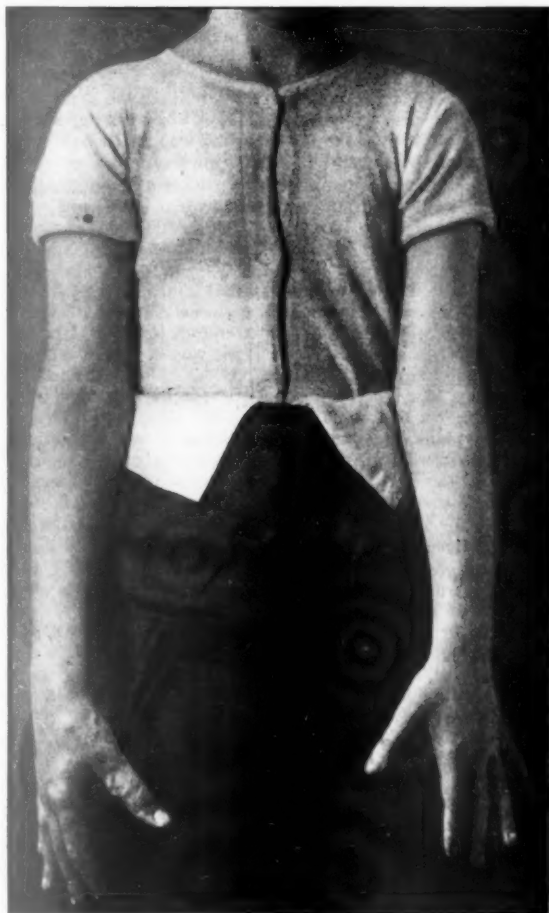
THE patient is a girl aged 13 years. Her mother has noticed for about eighteen months that the veins of the right arm swell and also that the right arm seems larger than the left. The duration of the condition is certainly longer than eighteen months, for the mother stated that for at least a year previously she had been making the right sleeve of the child's dresses longer than the left. There are no symptoms except a pricking sensation when the arm is hanging down.

On examination: the right upper limb is quite obviously larger than the left, both in length and in girth. The actual difference in length is $1\frac{3}{4}$ in., and the disproportion is greatest in the distal parts. The hand is usually somewhat bluish in colour, and scattered over the limb are a number of small cutaneous angiomas. The superficial veins are greatly dilated and many of them are tortuous, but they do not pulsate, nor can a thrill be detected. On grasping the whole forearm, however, the soft tissues can be felt to pulsate, showing that the condition is not limited to the veins, but there seems to be no evidence of arterio-venous anastomosis. The affected limb is always definitely warmer to the touch than the other is.

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I have just had a report from my colleague, Mr. Bickerton, who says this child has disseminated choroiditis. The Wassermann test has not yet been done, but Mr. Bickerton has very little doubt that this is a true congenital syphilitic condition. I have adopted for the case the name which was I believe first suggested by Dr.



Parkes Weber,¹ who has described some cases and reviewed the literature. What is the ultimate prognosis in these cases? Is the tendency towards arrest, or do they progress?

Brit. Journ. Child. Dis, 1918, xv, 13.

22 Beatty: *Hæmangiectatic Hypertrophy of the Arm*

Discussion.—Dr. PARKES WEBER said this was an excellent example of the kind of case to which he (the speaker) had referred in his paper of 1918.¹ The affected limb was enlarged in length, but in comparison with cases of true "gigantism" of fingers or toes, the hypertrophy was of minor degree. A possible theory to account for the hypertrophy was that for some reason, perhaps some local nervous disturbance during intra-uterine life, the blood-vessels of the limb in question were functionally stimulated, so that they developed rapidly, and often partially misdeveloped, with hæmangiectatic and telangiectatic formations (tumour formations) of various kinds. The excessive blood-supply seemed to be the direct cause of the hypertrophy of the affected limb in these cases. In the present child there was excessive pulsation of the brachial artery in the affected limb, and the condition would probably progress, but he (Dr. Weber) was against any drastic (surgical) treatment.

In regard to the possible presence of congenital syphilis in the present case, he would like to see statistics showing in what proportion of cases of congenital abnormality congenital syphilis was present. A statistical inquiry of that kind was, he thought, very much needed—in regard especially to certain writings by French physicians.

Dr. E. A. COCKAYNE said that in many cases of congenital abnormality he (the speaker) had had the Wassermann test made, and the reaction had nearly always been negative. If syphilis was present in these cases he (Dr. Cockayne) regarded it as an accidental association. This patient had an extensive nevus of the arm, and happened to have congenital syphilis as well.

Dr. PARKES WEBER (in further comment) said that some doctors were equally emphatically of opinion that there was a causal connexion between congenital syphilis and congenital malformations, and this view was carried to an extreme in France. Hence the importance of such a statistical inquiry as he had advocated. Little was at present known concerning what did produce congenital abnormalities, though various valuable experimental results had been obtained in animals. One could perhaps conceive that during early intra-uterine life the parent cells of some part of the fœtus might, under some toxic influence (alcoholism in the mother, congenital syphilis, etc.), make, so to speak, a mistake in developing, so as, for instance, to give rise to a rudimentary limb, a bifid finger, etc. In his (Dr. Weber's) experience, however, in children with congenital malformations the Wassermann reaction was usually negative and there was no evidence of any congenital syphilis.

Dr. COCKAYNE (in reply to Dr. Parkes Weber) said that there was some evidence that non-hereditary abnormalities could be produced by toxins, but the experience of most people in this country was that a positive Wassermann reaction was unusual in these non-hereditary abnormalities. Judging from the French literature, scarcely any child was free from syphilis in France.

Dr. KINGSTON BARTON said that in this patient's right thumb was what looked like a nevus, which pulsed violently, but on compression of the brachial artery this pulsation stopped. He (the speaker) derived the impression of there being an arterio-venous communication. Probably the whole of the artery, from the subclavian, was dilated, or was without a muscular coat.

Dr. JEWESBURY said that in his own series of cases of congenital syphilitic children he had never found any congenital abnormality.

Dr. J. D. ROLLESTON (President) said that some time ago Dr. Donald Paterson, in collaboration with Dr. Wyllie,² published a similar case of enlargement of the femur and tibia in association with nevus. It was true that, in the opinion of many, too much importance had been attached to congenital syphilis in the etiology of these congenital malformations, and other morbid conditions, in children. The best example was rickets, which Parrot was inclined to regard as always of syphilitic nature, a view which was strongly opposed in this country. With regard to congenital malformations, it was Edmond Fournier,³ the son of the Professor of that name, who had written most on the association of congenital malformations with hereditary syphilis: in fact the speaker did not think there was any malformation which Fournier did not so attribute. When he (Dr. Rolleston) used to attend the Hôpital St. Louis in Paris some years ago, his experience was that Fournier's successor, Professor Gaucher, took the same exaggerated view as to the part played by syphilis in these malformations.

¹ F. Parkes Weber, "Hæmangiectatic Hypertrophy of Limbs, Congenital Phlebarteriectasis, and so-called Congenital Varicose Veins," *Brit. Journ. Child. Dis.*, London, 1918, xv, p. 13.

² *Brit. Journ. Child. Dis.*, 1925, xxii, p. 36.

³ "Stigmata dystrophiques de l'Hérédosyphilis," Thèse de Paris, 1897-8, No. 391.

Section for the Study of Disease in Children

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Right Hemiatrophy.

By SIBYL R. EASTWOOD, B.M.

A. W., AGED 6 years, female.

History.—First seen at Guy's Hospital in January, 1926, during an attack of acute rheumatism following on two years of frequent pain in feet and limbs. She improved on treatment and was lost sight of till November 22, when she came to me again, having just been in the infirmary for chorea. Her heart was moderately enlarged, and there was an apical systolic bruit. I noticed that the whole right buttock was smaller than the left, with obvious flattening of the gluteal fold. There was no evidence, either clinical or X-ray, of abnormality of spine or hip-joint.

The patient's mother said that the choreic movements were entirely on the right side, but the resident medical officer of the infirmary could not find notes confirming this statement. As there is slight but definite asymmetry of the face, the right orbit appearing smaller than the left, the condition may be one of congenital hemiatrophy rather than of muscular paresis following chorea, and I should value the opinion of Members of the Section on this point.

Discussion.—Dr. PARKES WEBER said he could not satisfy himself completely that one side was larger than the other; assuming, however, that those who had found it so were right, he regarded it as a case of unequal development of the two sides, but within the normal variation limits. He asked whether the child was right-handed or left-handed.

Dr. E. STOLKIND said he could not see much difference between the two sides in this patient; the alteration might be only in an initial stage; it would be of advantage to see the patient again in a year's time.

Dr. EASTWOOD (in reply) said the reactions had not yet been tested in this case. If any increase in the asymmetry should develop, she (Dr. Eastwood) would bring the patient before the Section in a year's time.

Bilateral Œdema of Feet.

By R. C. JEWESBURY, M.D.

PATIENT, girl, aged 18 months, twin.

History.—Full term, difficult labour (breech presentation), birth-weight 6½ lb., breast-fed one year, walked at age of one year, measles at age of one year, no other illness.

Swelling of both feet noticed since age of two days old (see figs. 1, 2). The swelling has been persistent—posture makes little difference, but it increases and is slightly marked after walking. It is affected by temperature and is worse in cold weather—also there is some blueness of feet when cold. Mother has noticed occasional blanching of big toes, which then become cold. General health good. No œdema has been noticed elsewhere. Urine normal. Skiagram of feet shows no bone changes.



FIG. 2.

Bilateral edema of feet.



FIG. 1.

Section for the Study of Disease in Children

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Tumour in the Kidney Region.

By R. C. JEWESBURY, M.D.

GIRL, aged 6 years, came to hospital ten days ago, with a history of hæmaturia. A mass was felt on the left side of the abdomen, which seemed to be in close contact with the anterior abdominal wall. It was very hard, and its upper edge could not be felt. At first it seemed that it might be a large spleen. When the patient was examined under an anæsthetic and the muscles were relaxed, the tumour was found to be larger than at first it had appeared to be; it filled up the loin. It can be pushed forward from the loin anteriorly, and at times there is a colonic resonance over the front of it. Therefore I believe it to be a renal or peri-renal growth. There are no changes, such as one associates with loss of function of the adrenal body, and there is the presence of hæmaturia, so I think it is a tumour of the kidney itself, and probably malignant.

These tumours are more common in children younger than this patient. In the three similar cases which I have previously had the patients have all been under two years of age. All three were operated upon, two died, the other is still alive, and the last report was that the child was fairly well. 219 cases of renal tumour were reported by Steffen in 1905, of these thirty-four occurred during the first year, fifty-three occurred during the second year, and 108 under 5 years.

I propose to have a laparotomy done in this case, and the tumour removed. I exhibit a skiagram of the case, which shows a definite opacity on the left side of the abdomen.

Postscript.—Since the meeting this patient has been operated on and a large sarcoma of the kidney was discovered and removed. A very small amount of renal tissue was left unaffected by growth. Microscopic sections proved the tumour to be a sarcoma. The patient so far is doing well.

Discussion.—Dr. PARKES WEBER said he thought that the first of these cases was an example of congenital or early developmental œdema of the Milroy familial type, though there was no familial history. He did not think the cases with a familial history were more common than those without. Milroy was not the first to describe familial cases; an excellent familial series had been previously described by Nonne. The evidence seemed to point to the second case being one of sarcoma, and that would account for the hæmaturia. There were no special signs present suggesting a tumour of the suprarenal cortex.

Dr. E. A. COCKAYNE said he thought the first case was an example of Milroy's disease. As to the second case the commonest renal tumours in very young children were mixed tumours. Last year he (the speaker) had seen a child, aged 4 years, with bilateral mixed tumours of the kidney. This was the oldest child whom he (Dr. Cockayne) had seen with this condition. He thought hæmaturia was not very common in these cases. The present case was most probably one of malignant growth of the kidney, but the hæmaturia and the child's age were against the diagnosis of mixed tumours.

Dr. J. D. ROLLESTON (President) discussing the first of the two cases, said that he had shown a case before the Clinical Section ten years ago.¹ The patient was a ward-maid in a

¹ *Proc. Roy. Soc. Med.*, 1916-17, x (Clin. Sect.), p. 39.

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Jewesbury: Tumour in the Kidney Region

military hospital, and he (Dr. Rolleston) had detected the condition when she was being examined as to her fitness. There was an extraordinary condition of the legs, resembling elephantiasis, and he (the speaker) thought it must be a case of Milroy's disease. Dr. Parkes Weber had confirmed that diagnosis. That patient's age had been 22 years, and she had had the condition in both legs and feet since birth. Her mother had been similarly affected.

Dr. JEWESBURY (in reply) said he did not think his first case could be one of Milroy's disease, as it was not really congenital; also the mother and father were still alive, and five other children, and not one of them showed a similar condition.

Clinical Section.

President—Sir HERBERT WATERHOUSE, F.R.C.S.

Left-sided Muscular Wasting (Erb's Palsy Type) for Diagnosis.

By SIBYL R. EASTWOOD, B.M.

A. F., MALE, aged 16.

History.—Brought into hospital on August 5, 1926, after being thrown from his bicycle by a motor omnibus. He was suffering from severe concussion, also bruising and superficial abrasions of face, left shoulder, right wrist and left hip. No fracture of bone was detected on clinical examination, and this was confirmed by X-rays. On August 9, when he no longer showed symptoms of cerebral irritation, it was noticed that he could not abduct his left arm. This disability has persisted. Since September 17 he has been under the care of Mr. James McClure as an out-patient. This shoulder has been kept continuously abducted in order to secure relaxation of the paralysed muscles, and he has had daily massage and electrical treatment. No improvement has taken place.

Present Condition.—The shoulder on the affected side is held higher than the other. This asymmetry gives an appearance to the contour of the neck suggesting some loss of substance in the left trapezius, especially in the upper fibres, but the muscle acts strongly and responds to faradism. There is atrophy and paralysis of the left supraspinatus, infraspinatus, deltoid, biceps, coraco-brachialis, brachialis anticus and supinator longus muscles. The clavicular portion of the pectoralis major is wasted, and this is well shown when the sternal portion of the muscle is in action. The rhomboids and levator anguli scapulae are unaffected. The triceps extends the elbow strongly against resistance, and the serratus magnus acts normally; their very slight relative weakness is no more than might be due to partial disuse. Some flexion of the elbow is obtained by a trick movement—using the wrist flexors and pronator radii teres. The hand and wrist are as strong as on the right.

Diminished sensibility to touch, pain, heat and cold has been made out over a crown-sized area about the insertion of the deltoid, and complete loss to touch over a smaller portion of this area. This was definite some weeks ago, but has varied since and is now very slight. I am not sure whether this is due to recovery of function, or to the well-known difficulty of getting accurate results from repeated examinations of sensibility.

Looking at the patient's neck from behind, it will be seen that there is marked deviation to the left of the spine of the seventh vertebra. This deviation is constant in all positions. He gets full range of movement, without any pain or discomfort, and no pain or tenderness can be elicited by pressure or percussion.

Ophthalmoscopic Examination (Mr. A. E. Loosely).—Slight pallor, and blurring of the disc margins, suggesting a past papillitis.

X-ray (J. C. Macduff).—Stereoscopic films of the cervical spine are shown. The texture of the bone is normal. The joint space between the 5th and 6th vertebrae is less than between the other bodies, but the slight curvature may be influencing the appearance in the films.

Wassermann reaction negative.

Electrical reactions confirm clinical findings.

The possibility of disease or injury to the cervical spine has been considered. One diagnosis suggested was that of unrecognized anterior poliomyelitis, but the presence of sensory change rules this out. Rupture of the fifth cervical nerve at its juncture

32 Willis and Ogilvie: *Radicular Paresis*; Willis: *Acromegaly*

with the 6th, or stretching of a degree amounting to physiological rupture, is an adequate explanation of the clinical findings. The opinion of the Section is invited upon the diagnosis and upon the advisability of operation.

Radicular Paresis of the Right Hand associated with Abnormal Bone Formation of the Seventh Cervical Vertebra and Sprengel's Shoulder.

By F. E. SAXBY WILLIS, M.D., and W. H. OGILVIE, M.Ch.

MRS. A. D., aged 56. Housewife. Duration of disease, six years.

History.—Has noticed weakness of the right hand for six years, the weakness consisting of inability to extend the fingers at the metacarpo-phalangeal joints.

The right hand is held flexed at the metacarpo-phalangeal joints. There is wasting of the dorsal interossei. There are no sensory changes.

The electrical reactions show R.D. of the common extensors. X-ray examination of the right shoulder (Dr. Gage) shows an abnormal bone formation on both sides of the seventh cervical vertebra (not typical cervical ribs). On the right side there is only a rudimentary first dorsal rib or prolongation of the lateral process, the abnormalities being associated with a Sprengel's shoulder deformity.

Points of Special Interest.—The paresis corresponds with a lesion of the seventh cervical nerve root, which would appear to be caused by the abnormal bone formation in the lateral process of the seventh cervical vertebra. The association with Sprengel's shoulder and the absence of other symptoms are unusual.

Dr. F. PARKES WEBER thought that in this case there were bilateral seventh cervical ribs "of the short kind," such as have been associated in many published cases with weakness and muscular atrophy in one or both hands. In some such cases the hand-symptoms had been first noticed in later life, together with the onset of kyphosis or other "degenerative" changes which slightly altered the relative position of the nerves and bony parts in the neck.

Acromegaly of (?) Traumatic Origin, with Proliferative Changes in the Interphalangeal Joints of the Left Thumb and Middle Finger.

By F. E. SAXBY WILLIS, M.D.

MRS. V. McE., aged 28, Housewife. Duration of disease: three years.

History.—Seven years ago was thrown from a trap on to her head and sustained a severe concussion, from which she made an apparently good recovery.

About January, 1924, noticed a tendency to painful swelling of the hands and feet, especially in the heels. The pain and swelling have increased and in January, 1925, she had to take a larger size in shoes, and again a size larger in June, 1925.

In June, 1925, pain was noticed in the jaw.

In July, 1924 (eighteen months after marriage) cessation of the menses occurred. They have not been resumed.

Has been subject to severe frontal headache since childhood, but the headaches have been more severe in the last eighteen months.

Previous history: general health good; subject to sore throats. No children.

Points of Special Interest.—Acromegalic facies. Large hands and feet, a special feature being the inflammatory swelling in the proximal interphalangeal joint of the left middle finger and both joints of the left thumb (X-ray shown). The optic discs show no atrophy, but there is a restricted field of vision in the upper temporal quadrant of the right eye.

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X-ray Appearances (report by Dr. Gage).—Skull: The skiagrams show a very much enlarged pituitary fossa, also evidence of old injury to the occipital bone. The changes in the skull and jaw are consistent with acromegaly.

Hands: Chronic proliferative bone changes in both joints of the left thumb and the proximal interphalangeal joint of the middle finger, appearance atypical. The terminal phalanges of all digits are enlarged.

Sugar tolerance: After ingestion of 200 grm. of glucose no glycosuria. After ingestion of 300 grm. 0·7 per cent. of sugar in urine.

Result indicates an increased sugar tolerance.

Discussion.—Dr. F. PARKES WEBER remarked that the alteration in the soft parts of the patient's face (the pale, fleshy enlargement of the regions of the nose and mouth) was characteristic of acromegaly. This, together with the enlargement in the feet and the other points mentioned by Dr. Saxby Willis, left scarcely a doubt that the case was a genuine one of acromegaly. The changes in the inter-phalangeal joints were probably arthritic and not due to acromegaly. The traumatism was apparently of too early a date to be invoked as an exciting cause of the condition in the anterior lobe of the pituitary gland that led to the acromegaly.

Dr. E. STOLKIND said that, in his opinion, this was not a case of acromegaly of traumatic origin. The patient was thrown from a trap on to her head seven years ago; she was in bed for one day. Only four years ago she had noticed a tendency to painful swelling of the hands and feet. There were on record a number of cases of acromegaly in connexion with trauma and specially with head injuries. In the text-books this aetiology was alleged, but he (Dr. Stolkind) had been unable to find in the literature a single proved case of acromegaly of traumatic origin. For instance, in the case recorded by Bleibtreu the patient, aged 21, had fallen on the staircase but continued his work immediately without being laid up at all. He was in good health for the next five years and very energetic. But he had noticed when he was about 17 that he was beginning to grow rapidly. Four years later, i.e., at the age of 21 gigantism and acromegaly were diagnosed. In his twenty-second year he developed pulmonary tuberculosis and died eight months later. At the post-mortem it was found that the hypophysis was destroyed, probably by a hæmorrhage. As there was no X-ray examination, no proof as to when the pituitary gland became affected was forthcoming. Thus it was not proved at all that the disease of the pituitary gland was in any way connected with the slight accident.

Dr. Saxby Willis's patient so far had not the typical features of an acromegalic either in the face or in the hands. There were no signs of prognathism of the lower jaw. The ears were not enlarged. There was no macroglossia. The thickened fingers at first gave the same impression as in cases of acromegaly, but the X-ray films showed that the bones were not enlarged. The exostoses in cases of acromegaly generally existed at the terminal phalanges.

The cessation of menses, though it had been observed in many cases of acromegaly, might be caused in other ways, e.g., by an infantile uterus. The skiagrams showed a rather enlarged sella turcica, but not to the extent seen in typical cases of acromegaly. For the present he (Dr. Stolkind) could not say that it was a proved case of acromegaly. It was probable that after some years the typical signs of acromegaly might appear in this patient.

Case of Essential Thrombocytopenic Purpura Hæmorrhagica a year after Splenectomy.

By BERNARD MYERS, C.M.G., M.D.

MRS. E. D., aged 30, has already been shown several times before this Section as a severe case of essential thrombocytopenic purpura hæmorrhagica, from which she has suffered for eighteen years. About five or six times a year she was troubled with bleeding from the mouth and other mucous membranes. She further suffered from severe menorrhagia, which, on many occasions, necessitated her immediate admission to the Royal Waterloo Hospital.

34 Milligan: *Tuberculous Ulceration*; Parsons-Smith: *Heart-block*

All the usual methods of treatment, such as calcium salts, sera and blood transfusion, failed to do more than slight temporary good, and it is doubtful whether the first two were of any use at all.

She had the typically greatly reduced blood platelets, normal coagulation time, increased bleeding time and also a positive capillary resistance test.

Early last year my colleague, Mr. Rodney Maingot, carried out splenectomy, and since then her health has been excellent, there has been no bleeding from the mucous membranes, the menses are quite normal in every way and no more purpuric spots have occurred on the skin.

The blood examinations made by Dr. Knyvett Gordon show that the blood platelets, etc., soon returned to normal after the operation. The bleeding time and capillary resistance test are now normal.

Tuberculous Ulceration of Lip.

By W. A. MILLIGAN, M.D.

MRS. P., aged 47. Married. One child.

History of tuberculous disease on her side. When a child she had a sinus under the chin which continued to discharge for a long time. Health up to last year quite good.

About June, 1926, patient noticed a small pimple on lower lip; this, instead of disappearing, gradually broke down and formed an ulcer which gradually spread, involving the whole surface of the lower lip in an ulcerating sore. The lip also became very painful. Enlarged glands noted over the body about the same time.

Blood-counts (October 22, 1926): Red blood-corpuscles, 3,000,000; white blood-corpuscles, 200,000; hæmoglobin, 55 per cent.; small mononuclears, 96.6 per cent.; large mononuclears, 0.4 per cent.; polymorphonuclears, 2.6 per cent.; eosinophils, 0.4 per cent.

Dr. F. PARKES WEBER remarked that the condition of the lower lip seemed to be due, as in most similar cases, to a chronic streptococcal infection, with chronic lymphangitis and blocking of the lymphatics, that tended to give rise to gradual elephantiasis-like swelling of the affected part. There seemed no sufficient reason to invoke a local tuberculous lesion as well. The prognosis was probably modified in the present case by the presence of chronic lymphatic leukemia.

Complete Heart-block.

By B. T. PARSONS-SMITH, M.D.

J. H., MALE, aged 70.

History.—First seen July, 1925, suffering from frequently recurring syncopal seizures with bradycardia, the latter having been noted during the past few weeks. Previously health uniformly good except for occasional attacks of bronchitis, an attack of pneumonia in 1918, and a fainting attack (thought at the time to be sunstroke) in 1923; has always smoked excessively; always moderate in use of alcohol.

Examination.—Heart not enlarged; normal area of dullness; feeble apex impulse fifth space $3\frac{1}{4}$ in. from the mid-line; rhythm a regular bradycardia at 30; heart sounds vary in intensity, occasional accentuation being observed; soft systolic murmur at apex region; pulse 30; blood-pressure 180 mm. systolic, 90 mm. diastolic; frequent syncopal attacks, with convulsions, during the course of the examination.

Diagnosis.—Complete heart-block (confirmed by electro-cardiographic and polygraphic tracings) with Adams-Stokes' syndrome.

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Progress.—Gradual improvement under treatment, and relief from syncopal seizures following course of adrenalin injections; normal quiet routine of daily life resumed; occasional giddiness and sensation of heavy beating of heart at nights but otherwise no subjective symptoms in spite of the fact that complete heart-block, with pulse-rate of 30, persisted.

Recurrence of syncopal attacks, April, 1926; treatment again effectual. Barium chloride ($\frac{1}{2}$ gr. twice daily) prescribed, July, 1926, and subsequently pulse-rate noted to be faster—40-50 rather than 30, which formerly had always been the count.

Later (November, 1926) pulse-rate rose to 72 and electrocardiograms showed that the normal heart rhythm had been restored; considerable improvement in the exercise tolerance noted at this time and complete relief from all the pre-existing symptoms.

Recurrence of complete heart-block noted at examination on December 21 (in spite of the fact that barium chloride $\frac{1}{2}$ gr. doses had been continued), but the original symptoms still in abeyance.

Note.—This case is shown to illustrate the possible advantage of the prescription of barium chloride in complete heart-block; the slow acceleration of the ventricular rate culminating in the transient return of the normal rhythm is noteworthy, as also the definite relief from the symptoms and the improvement in the exercise tolerance.

Aleukæmic Lymphadenosis.

By F. PARKES WEBER, M.D.

THE patient, M. L., aged 60, a Polish Hebrew tailor in London, is a well-built but rather plethoric-looking man with symmetrical, general, moderate enlargement of all the superficial groups of lymphatic glands (cervical, submaxillary, præ-auricular, axillary, supracondylar, inguinal and femoral). He sought medical advice because about three months ago he chanced to feel the glandular nodules at the back of his neck. It was owing to that alone that he knew there was anything wrong with him. He never previously had any serious illness and there is no history of abuse of alcohol or tobacco. He has slight arcus senilis. The liver and spleen are apparently not enlarged, and there is no evidence of anything abnormal in the thoracic or abdominal viscera, excepting that X-ray examination shows some abnormal shadowing in the posterior mediastinum and hilus regions of the lungs. The urine is free from albumin and sugar. The brachial blood-pressure is 145 mm. Hg (systolic); 95 mm. (diastolic). The blood-serum gives negative Wassermann and Meinicke reactions, and the Pirquet cuti-reaction for tuberculosis is positive, as it mostly is in adults. Ophthalmoscopic examination (by Dr. C. Markus) shows nothing abnormal.

Blood-count: hæmoglobin, about 100 per cent.; erythrocytes, 5,320,000 per c.mm. of blood; white cells, 10,300. Differential count of 500 white cells (Dr. J. Axhausen): polymorphonuclear leucocytes, 49.4 per cent. (young forms, 0.8 per cent.; with rod-shaped nuclei, 1.1 per cent.; with segmented nuclei, 47.5 per cent.); small lymphocytes, 21.4 per cent.; large lymphocytes, 24 per cent.; monocytes, 1.2 per cent.; basophils, 0.2 per cent.; eosinophils, 0.6 per cent.; lymphoblasts, 3.2 per cent.; no myelocytes. On another day the oxydase (peroxydase) reaction was tried, and it was found that of all the white cells 43 per cent. gave a positive and 57 per cent. (37 per cent. large cells, and 20 per cent. small cells) gave a negative reaction.

REMARKS.

The case is almost certainly one of *chronic lymphatic aleukæmic lymphadenosis*—formerly often termed lymphatic pseudoleukæmia and confused with Hodgkin's disease—in other words, a case of chronic lymphatic leukæmia, without as yet any

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Ogilvie: *Tumour of Calf*; Wakeley: *Paget's Disease*

great increase in the total white blood-cell count, though the lymphocytes are in relative excess. The symmetrical enlargement of the superficial lymphatic glands can hardly be due to tuberculosis, and in Hodgkin's disease (lymphogranulomatosis maligna)—at all events in the earlier stages—one group of lymphatic glands is almost always more enlarged than the others. Moreover, in Hodgkin's disease, when there is slight excess in the white cell blood-count, it is generally the polymorphonuclear leucocytes that are increased in number. The absence of blood-eosinophilia should also be noted, though by itself it does not, of course, exclude Hodgkin's disease.

In regard to prognosis, so little is, I believe, known of the natural course of cases like the present one, if left to themselves without special medical treatment, that one cannot be sure that it is wise to interfere by any (so-called) therapeutic measures. The disease has not yet caused any symptoms apart from the actual enlargement of the lymphatic glands, which the patient felt by chance. Is there not a danger that active treatment (X-rays, &c.) may convert a chronic inactive case into an actively progressive one? A similar question arises in cases of typical chronic lymphatic leukaemia in which the total white-cell blood-count is not greatly increased, especially in elderly individuals, when the erythrocyte-count is slightly above the normal or hardly below the normal (cf. F. Parkes Weber, "An Instance of Long Quiescence of Leukæmia," *Proc. Roy. Soc. Med. (Medical Section)*, 1915, viii, pp. 28-31).

The same question occurs in regard to the relatively rare cases of chronic lymphatic leukemia with enlargement of spleen and liver, but not of the superficial lymphatic glands, and with normal erythrocyte-count. I have had a recent example of this kind of case in a woman aged 58.

Tumour of Calf.

By W. H. OGILVIE, M.Ch.

PATIENT, a male, aged 59.

History.—Forty years ago, at the age of 19, "twisted" left leg; bones not broken; three months in hospital. During the ensuing twelve months a lump appeared in the left calf; for eleven months since the growth has remained stationary and has given no trouble. Entered army at age of 27.

Examination.—Large rounded swelling in left calf; deep to gastrocnemius; elastic, but not fluctuating; not tender. A query is raised as to the nature.

Paget's Disease with Renal Calculi.

By C. P. G. WAKELEY, F.R.C.S.

W. H., AGED 67; male; hall-porter.

Enlargement of head first noticed six years ago; bowing of legs for four years.

Some renal calculi were removed from left kidney twenty-six years ago at St. Peter's Hospital.

For the last ten years he has had periodical attacks of pain in the left loin. At Christmas, 1925, he had a severe attack of renal colic.

November, 1926; An attack of typical renal colic on left side, followed by swelling of right testicle. X-ray examination showed four large stones in left kidney. Cystoscopy, November 30, 1926: Cystic cystitis found present, and a little pus exuded from left ureter. A ureteric catheter was passed into right ureter and left for several hours; urea concentration of right kidney found to be 2.74 per cent.

Nephrectomy performed on December 6, 1926. Operation difficult owing to the kyphosis due to Paget's disease, the last rib coming down almost in contact with the iliac crest.

Recovery uneventful.

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Cirroid Aneurysm of Right Suprascapular Artery.

By C. P. G. WAKELEY, F.R.C.S.

G. S., MALE, aged 66 years; a retired porter.

First noticed a lump and swelling over the right suprascapular region about six months ago. He has had a nævus in this situation since childhood.

Examination showed a nævoid condition over the right suprascapular region at upper border of trapezius; slightly below and to the outer side of this there is a pulsating swelling, elongated in outline, extending in a downward and outward direction about 3 in. in length. Coursing downwards and slightly outwards from this is a dilated and tortuous vein with thickened walls.

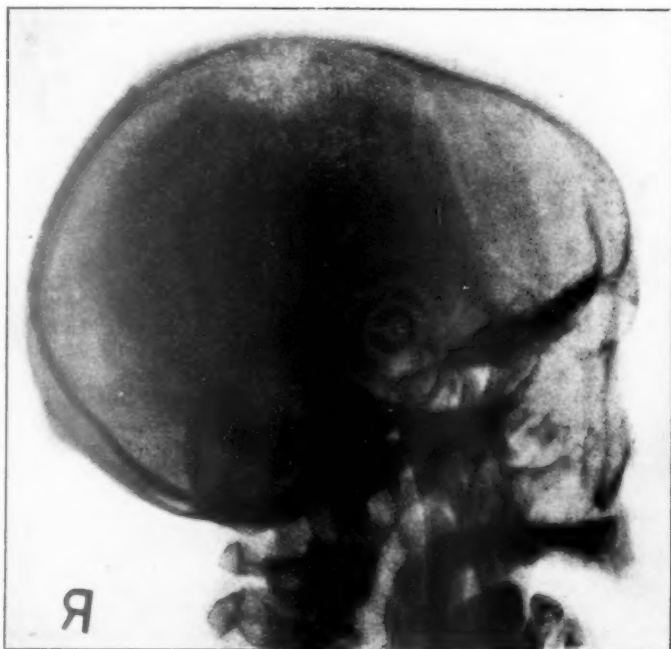
On palpation of the tumour, pulsation is marked and there is a distinct thrill. A diastolic bruit is heard with the stethoscope all over the swelling. Pressure over the right subclavian artery completely eliminates the bruit of pulsation, and if the tumour is emptied by pressure when the subclavian is obliterated, there is no tendency to filling until the subclavian artery is released.

Hæmangioma Causing Jacksonian Epilepsy.

By C. P. G. WAKELEY, F.R.C.S.

W. F., MALE, aged 68.

Patient was shown by Dr. East before this Section in November, 1926, as a case of tumour of the skull.¹ At that time there was definite evidence of a left-sided

¹ *Proceedings*, 1926, xx (Clin. Sect.), p. 3.

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spastic hemiparesis, coming on with Jacksonian seizures affecting the left foot, arm, and sometimes the left face.

X-ray.—This shows a definite area of rarefaction of bone corresponding to the termination of the middle meningeal arteries. The inner table of the skull appears to be involved.

Operation by Mr. Wakeley, November 5, 1926.—Large osteoplastic flap turned down over right parietal region, large vascular tumour exposed. Owing to fall of blood-pressure to 80 mm. Hg, osteoplastic flap replaced and scalp sutured in position.

Second stage operation, November 15, 1926.—Osteoplastic flap turned down and the tumour, which was situated on the outer side of the dura mater, excised. It was flattened out and about $\frac{1}{4}$ in. in thickness and very vascular. Bleeding stopped by means of the diathermy-cautery. Scalp stitched in position. Wound healed well.

Present condition.—Patient able to walk about but still drags his left leg.

Dr. F. PARKES WEBER said he had thought that the tumour might have arisen in a Pacchionian body, and the fact that the operation showed that the tumour was a meningioma suggested that a Pacchionian body might well have been the site of origin.

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President—Sir D'ARCY POWER, K.B.E., F.R.C.S.

The Helminth Parasites of Animals and Human Disease.

By THOMAS W. M. CAMERON, M.A., B.Sc., Ph.D., M.R.C.V.S.

(Department of Helminthology, London School of Hygiene and Tropical Medicine.)

PARASITOLOGY, better perhaps than any other branch of medicine, serves to draw attention to the close inter-relationship existing between curative, preventive and comparative medicine.

A survey of the animal parasites of man shows that, with very few exceptions, he shares them, to some degree at least, with the lower animals, and it is the purpose of this paper briefly to review these forms and to comment upon their significance.

Man as an Intermediate Host.—Apart from the single case of *Hymenolepis nana*, all cases in which man is infested with the asexual stages of endo-parasites must be considered as accidental. In all these cases the parasite is side-tracked, and the chances of its continued existence are so slight as to be negligible. The parasite, to complete its life cycle, must leave its intermediate host at some period, and when this intermediate host is a mammal, this only occurs, under natural conditions at least, when its flesh is eaten by some carnivorous or omnivorous animal. The chances of man being thus eaten are so slight that parasites which took this risk would very soon be exterminated. Nevertheless, some forms do accidentally use man in this way and are the more dangerous because accidental. There tends to be a tolerance between parasite and normal host; if the host suffers too much it may die and with it the parasite.

Perhaps the most serious of these is the well-known hydatid cyst—a parasite which is only too common in Britain.

HYDATID.

I have recently drawn attention to the recent advances in our knowledge of the complicated life history of *Echinococcus granulosus* (see *Proc. Roy. Soc. Med.*, 1927, xx (Section of Tropical Diseases and Parasitology), pp. 272-283); it will be necessary only to discuss its epidemiology here. The adult parasite lives in carnivorous animals, the dog being generally considered the commonest host; but there is evidence that, in this country at least, the fox is very commonly affected, and this animal may play no small part in its spread; cats are only infrequently infected. The intermediate hosts are legion. Practically any mammal may harbour the hydatid cyst; sheep are most commonly infected, but horses and pigs are also very common hosts. The disease is, therefore, essentially one of pastoral countries. There sheep constitute a large reservoir from which dogs are continually infected, and the opportunities for human infection are thereby enormously increased. The classical homes of the disease are countries where sheep rearing is a staple industry—Australia, Iceland, South America, North Africa, and so on. In some of these countries infection reaches very high figures. In 1901, 40 per cent. of the pigs slaughtered in Buenos Aires were infected, and although this figure is now slightly less, the percentage of infected sheep and cattle has greatly increased and the mortality curve in man has followed the incidence curve in sheep. In Tunis, Dévé finds practically all old cattle, 20 to 60 per cent. of sheep, and 30 per cent. of camels are infected. Curiously enough, goats suffer but slightly in this area, and pigs appear to be free from infection. Einarsson has recently surveyed the incidence of

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the disease in Iceland, and finds that 12.5 per cent. of the sheep harbour the parasite. In New South Wales, Ross finds that about 30 per cent. of the sheep are infected, while at Melbourne, Dew records an infection in slaughtered sheep which varies from 40 per cent. to as high as 75 per cent.; cattle, however, show an infection of only 30 per cent., and then the cysts are often sterile or degenerate. There are no accurate figures available for Britain, but the number of sheep, pigs and horses infected is very considerable.

Infection of Man.—Although in human pathology hydatid is usually studied in the adult—especially between the ages of 20 and 40—it is in youth or even in infancy that the disease is usually contracted. Accordingly, in most cases, the cyst of the adult is one already old—a fact which explains the great proportion of abnormalities found in human hydatids. In children under 15 years, as a rule, the cyst is unilocular and uncomplicated (90 per cent. of cases), and as cysts are sterile until they reach the size of an egg, so-called “*acephalocysts*” are common. Owing to the very slow growth of the parasite, however, it is not until adult life is reached that symptoms begin to develop, but there are exceptions to this—hydatid of the head is commonest in young adults, as also is hydatid of the brain and orbit, where, for mechanical reasons, diagnosis is necessarily early.

Apart from the general helminthological rule, that young animals are more easily parasitized than adults, it is natural that children should be infected, owing to their intimacy with dogs and to their rudimentary notions of hygiene.

It has been generally considered that drinking water is the commonest source of infection, but Ross, who has recently investigated this problem in Australia, contests the importance of water. *Echinococcus* eggs, like most other helminth eggs, do not float in water in the state in which they are usually passed in the faeces. Accordingly drinking of surface water should not commonly cause infection. Should the ova reach household tanks, if they float, they will not reach the drinking water unless the surface falls to the level of the tap; if they sink, as the vast majority do, they fall below the level of the tap, because taps are usually placed at least 2 in. from the bottom of the tank. Ross considers infection by water to be negligible, and he believes that in Australia, at least, contagion occurs through contact with dogs, especially by acquiring dried eggs on the hands from a dog's coat contaminated with dried faeces. Faecal contamination of foodstuffs—especially vegetables—is also probably a common source of infection. Dévé finds that in Tunis children are infected by dirt eating, and by uncooked vegetables, but mainly by caressing dogs and by contamination of plates and dishes by the animal's paws. In Iceland, Einarsson finds the greatest incidence in women, and this is due to keeping ewes in the houses in intimate contact with the women and young children, while the men go to the hills and fields with the flocks. The ewes are herded together, and their fleece rapidly becomes soiled with sheep-dog droppings, the eggs from which are mechanically transferred to the hands of the women. Dévé believes that the washing of hands before cooking and eating would materially diminish the infection. This advice might well be taken by all who come into contact with dogs, and it would do much to reduce the incidence of hydatid cyst in human beings.

This is of course not the only cyst found in man, although it is by far the most important.

Two species of the tapeworm genus *Tænia* occur in man in their adult state—*Tænia solium* and *Tænia saginata*. There has always been confusion between them—indeed, it is probable that the *Tænia solium* of Linné was really *Tænia saginata*. The first species possesses the typical double row of hooks on the scolex, while the second is congenitally hookless; many of the older workers confused this appearance with one of senile decay or ill-treatment. In this way the impression

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grew that *Tænia solium* was a common parasite. On the contrary, it is a very rare one, and authentic records of its presence in Britain in recent years are very scarce; it does occur, however, but it is doubtful whether the sporadic cases are of native origin or have been imported in their cystic form in Irish pork. *Tænia saginata*, on the other hand, is not uncommon, and is often found in children who have been fed on minced raw meat. The cysts are seldom observed during meat inspection, because infections are generally very light and the muscles most commonly affected—the pterygoids, masseter, and other muscles of the jaw—are generally not examined. In some places, however, it has recently become customary to examine carcasses, especially for this parasite.

Though the normal intermediate host of *Tænia solium* is the pig, and of *Tænia saginata* the ox, the cysticerci may occur abnormally in other animals, including man. This is not uncommon with *Cysticercus cellulosæ* (which would be better called *Cysticercus solium*), but it is rare with *Cysticercus bovis* (or *Cysticercus saginata*). The cysts in these cases frequently become localized in abnormal situations such as the eye, brain, meninges and so on, and this may produce very serious consequences. That is the chief reason why *Tænia solium* is much more dangerous a parasite than *Tænia saginata*. In sheep, in Britain as elsewhere, a cysticercus occurs closely resembling *Cysticercus cellulosæ* in appearance, but it is really the larval stage of a dog tapeworm, *Tænia ovis*; as this parasite will not develop in man, infected mutton is harmless to human beings.

One of the best known of human tapeworms is *Dibothriocephalus latus*, the broad tapeworm. It is very widely distributed throughout the world; it was at one time common in Ireland, but there appear to be no recent authentic records of its natural occurrence in Britain. It passes the first part (proceroid) of its asexual life cycle in certain species of water fleas, and its second (or plerocercoid) stage in fresh-water fish. The adults occur in man and many species of carnivores. The plerocercoid is very frequently seen in fish in Switzerland, although human infection is said to be rare in that country. The larva is commonest in the viscera of the fish, which is sold for cat food, and this may be a possible source of the heavy infection in the Swiss lakes. Human infection takes place from the relatively few plerocercoids which accidentally penetrate the flesh of the fish.

In man and many other groups of animals in Asia occurs the plerocercoid of another species (or possibly other species) of *Dibothriocephalus*, better known in medical literature as *Sparganum mansoni*. This species becomes adult in the intestine of the dog, cat and other carnivores, but these animals may also be infected with the plerocercoid stage. Some Japanese workers have recently identified this parasite with *Dibothriocephalus decipiens* of the dog, while Megget considers that all the plerocercoids which occur in reptiles belong to the species *Dibothriocephalus reptans*. However, as the original descriptions are too inadequate to identify them, it is probably better to group, for the present, in the single species *Dibothriocephalus mansoni* all the plerocercoids which occur in zoological groups higher than fishes, until we can make more definite diagnoses of the larval stages.

Among the roundworms which might be considered under the present heading is *Trichinella spiralis*, but as it occurs as a sexually mature adult in man before it produces larvæ, it will be considered in the next section.

It may be of interest to refer here very briefly to a peculiar condition of the skin called "creeping disease," in which the larval stage of some abnormal parasite moves about subcutaneously. This larva may be an arthropod (*Hypoderma* spp.) or a helminth (*Gnathostoma* spp.), but it has recently been shown that a single larva of a foreign hookworm may be responsible for this condition.

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MAN AS AN ACCIDENTAL DEFINITIVE HOST.

The most important of the parasites in this country which infect man in this way is the trichina worm, or *Trichinella spiralis*. How long the disease now called trichinosis has been recognized we do not know. It, probably more than the fear of *Tænia solium* infection, played a large part in the formulating of the Mosaic injunctions against the use of pork—injunctions which were in turn drawn from even older Semitic civilizations. The parasite itself was not recognized until 1828, when Peacock observed the larvae in London. It was described seven years later by Richard Owen from an Italian who had died, also in London, from tuberculosis. It was only twenty-five years later, however, that Zenker was able to show its connexion with the serious disease with which we now associate it. It introduced itself into politics about twenty-five years later still, when it was the cause of international complications between Germany and the United States. For some ten years American pork was excluded from Germany on this account, and from this the present very efficient American system of meat inspection directly resulted.

British meat inspection ignores the possibility of trichina infection of pork, and no attempt is made to search for it. On the Continent and elsewhere, however, very elaborate measures are taken to inspect pork, and large staffs and special apparatus are employed for this purpose. The importance of trichina infection depends entirely on the habits of the people. Where raw, undercooked, or smoked pork is customarily eaten it is a parasite to be feared; and it is in nations with such habits that we encounter the parasite most commonly. Where, however, as in Anglo-Saxon countries, it is customary to overcook all pork and pork products, the dangers are negligible; and this precaution is probably much more effective than the most perfect system of meat inspection, which after all may merely lead to a sense of false security. In the United States, where a fair percentage of pigs is infected, there were 320 human cases reported for the five years preceding the war, with a case mortality of about 6 per cent. Practically all these cases were traced to the consumption of raw sausage or ham, usually prepared at home or in small establishments. Where pork is prepared on the large scale, the dilution of the worms is generally such as to make infection negligible and too small in amount to cause disease. Practically all these American cases were confined to people who had still retained their Central or South European habits, while those of British or French origin were not affected.

It is outside the purpose of this paper to discuss the course of the disease, but it may be of interest to draw attention to the frequent diagnosis of typhoid fever or "ptomaine" poisoning in the acute cases, and to "rheumatism" in the subacute later stages of trichinosis. Like most parasitic infections, in the earlier stages there is observed considerable eosinophilia which, in this case, may reach as high a figure as 40 per cent.

Generally the disease is chronic in the pig; in fact, there may be no symptoms at all and the flesh generally is unchanged macroscopically. In rodents, on the other hand, the disease is often very acute, so acute indeed that doubts have been expressed as to whether these animals are normal hosts at all, or merely accidental agents by which the parasite may be further disseminated.

The distribution of the trichina worm in Britain is unknown. Cases in man are occasionally recorded, but it must be remembered that symptoms are directly proportional to the numbers of parasites ingested. Cases with slight infections probably show no symptoms at all, are not likely to come to the attention of the physician, and are still less likely to be diagnosed as trichinosis.

The list appended to this paper shows that a very large number of animal parasites are accidental in man. Some of these records are very doubtful, others are

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of merely academic importance, while a few are of sufficient interest to be mentioned here. Of these the commonest is *Dipylidium caninum*, an exceedingly prevalent parasite in dogs and cats, which not infrequently occurs in children. The intermediate stage is found in fleas and dog lice, and these are occasionally swallowed by children. The diagnosis of this parasite in children subjects the physician's tact to a considerable strain, but he is also often unnecessarily disturbed by confusing it with *Echinococcus*. The gravid segments of *Dipylidium*, which resemble a cucumber seed, are often found on the coat of the dog or cat, and so directly brought to the attention of the medical attendant. They differ considerably from *Echinococcus* in size and shape, and there should be no possibility of mistake. *Dipylidium* is not a very dangerous parasite, but its presence in children indicates that hygienically all is not as it should be.

Children also occasionally become infected with the several species of ascarid worms found in dogs and cats. Here, of course, infection is produced by swallowing the embryonated egg, and implies opportunities for faecal contamination of food or utensils.

Many parasites in animals occur in man so frequently as to be considered normal, and in connexion with these it is necessary to consider the questions of reservoir hosts and biological strains.

RESERVOIR HOSTS.

Many of the flukes which commonly infest man, especially in Asia, are as common, or even more common, in animals, and the animals are then termed reservoir hosts. The eggs laid by the parasites in the animals infect snails, and the cercariae which emerge are in turn ready to infect man.

Clonorchis infection of dogs and cats, for example, is very common throughout China and the Far East, and through these dogs and cats (and several species of wild carnivores) a continuous supply of infected fish is made available for human infection. The disease, however, only occurs in certain limited areas where eating of raw or improperly cooked fish is the rule. It is absent in man in Central China, but it is so common in animals there that if man in this area had the habit of eating raw fish, infections would be enormously heavy and much more serious than in the present endemic foci. There is an additional safeguard in this case, because in Central China the cercaria encyst mainly on the scales, while in Southern China they often encyst in the flesh. However, the presence of the disease in the reservoir host constitutes a grave potential danger.

Fasciolopsis is another fluke which has a common reservoir host in the domestic pig, yet curiously enough in certain areas where it is common in man it is uncommon in pigs, and vice versa. In certain parts they have a saying that "Where man has fluke disease, pigs do not; where pigs have fluke disease, man does not." Nevertheless, Barlow was able to infect pigs experimentally in an area where man alone seem to be infected. Why this should be so cannot at present be explained.

The Asiatic blood fluke of man, *Schistosoma japonicum*, occurs in a vast number of animals, and there is no doubt that this helps to keep up the supply of infected snails.

BIOLOGICAL STRAINS.

In certain cases various parasites of man seem to be morphologically the same as those of animals, but cross-infection experiments are not successful. Thus, the ascaris worms of man and of the pig cannot be morphologically distinguished. A number of feeding experiments have been made with these worms and the general results show that the species are not interchangeable, and it is suggested that

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biological strains may exist. In Trinidad human infection with *Ascaris* amounts to 64 per cent., while porcine infection is only 11 per cent., facts which seem to support this hypothesis. Recently, however, several Japanese workers have found that, although they were unable to infect healthy pigs with either porcine or human ascaris eggs, they were able to do so with both if vitamin A were withheld.

In the case of *Hymenolepis nana* there seems to be no difference morphologically between forms from man and mouse, but cross-infection experiments are negative and there seems to be no coincidence of geographical distribution. Though Woodland has succeeded in infecting a small number of mice with *Hymenolepis nana* of human origin, as Joyeux points out, it must not be assumed that because a laboratory animal may be experimentally infected with a parasite it is necessarily a normal host of that parasite. A similar state of affairs seems to exist between the *Necator* of pigs and of man and, although this has not yet been tested, there may be a similar relationship between the whipworms of man, monkeys, and pigs, which also are morphologically indistinguishable. This question of biological strains opens up matters of very considerable importance in the prevention of parasitic infections, but, until it has been settled, it is desirable to regard animals with these forms as potential sources of human infection.

There are very few helminths which are exclusively human in their habitat. The most important of these are: (a) *Ancylostoma duodenale* (which has been reported from the tiger and erroneously from the pig)—although the closely-related *Ancylostoma braziliense* of cats and dogs is not uncommon in man in certain parts of the world; (b) *Oxyuris vermicularis*, the common seatworm, although very closely-related forms occur in monkeys; (c) *Filaria bancrofti*; (d) *Schistosoma hæmatobium* and *Schistosoma mansoni*, although the related *Schistosoma japonicum* is found naturally in a bewildering number of hosts; (e) *Tænia solium* and *Tænia saginata*, although several very closely-related species occur in dogs.

One other important relationship between animals and the parasites of man remains to be mentioned, that is, the domestic animal—dog, pig, etc.—in his capacity as a scavenger. He devours human feces in many parts of the world, and in this way is able to disseminate helminthic eggs, which may pass unaltered through his digestive tract, over a much wider area than they would naturally be spread. This is a not unimportant factor which must be considered in connexion with hookworm campaigns.

From whence did the parasites of man originate? In these neo-Darwinian days, when the fact of evolution is generally admitted in man, we must assume that the parasites also have evolved. Most of the forms with which we are now dealing are so distantly related to the free-living forms that it is necessary to assume that they became parasitic before man became human; that implies the transmission at some time or another of animal parasites to man, with the probability that the more specific the parasite, the longer ago was that transmission.

Some groups, such as the Opisthorchidæ and the Heterophydidæ among the flukes, have a very wide range of hosts and it is probable that all the members of these groups will be able to exist in any fish-eating animal—mammal or bird. This may to a certain extent be true of the fish-borne Cestodes, such as *Dibothriocephalus*, but the Cestodes being more highly parasitic forms are probably rather more definite in their host requirements. It appears also to be true of such forms as the hydatid and the trichina worms, both of which depend on their intermediate host being eaten in order to continue their existence. Such forms bear a non-evolutionary explanation, or rather an economic one.

Among the other common parasites of man, however, it would seem that a variety of groups are necessary. For example, such forms as the pin-worm, *Enterobius*

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vermicularis, are peculiar to man, and their only close relations are found among the monkeys. I would suggest that these were originally simian parasites which first attacked man in his pre-human days, and which, owing to their peculiar life cycle (involving as it does an almost direct passage from anus to mouth) have had little opportunity of adapting themselves to other hosts and have in consequence become specialized.

Other forms, such as the whipworms, have a very wide species-distribution, being found in a great variety of different and zoologically separated types of animals. Most types have species which differ in details from the forms in other types of animals. These whipworms form a small isolated group among the nematodes and probably they are archaic forms which became different species in early evolutionary times, when probably *Trichocephalus trichiurus* became definitely attached to man.

Most of the remaining human forms can be separated into two great groups—those which have their nearest relations among the parasites of carnivorous hosts, and those which have their relations among the herbivores. Thus the cestodes of the genus *Tænia* are obviously carnivorous in their origin. All the related non-human species are found in carnivorous hosts; their essential life histories are in fact closely bound up with flesh-eating habits. In this group, too, would be placed the hookworm, *Ancylostoma duodenale*, which although almost exclusively human has on occasion been found in wild cats. The related forms which most closely resemble this form are all found in carnivores (*Ancylostoma caninum*, *Ancylostoma braziliense*, *Dochmoides*, etc.). The genus *Tænia* was probably a comparatively late comer into man's life; while *Ancylostoma* probably parasitized man in his early human (not pre-human) days. On the other hand, the hookworm, *Necator americanus*, is most closely related to forms which are associated with herbivorous animals. This form is moreover also found in the higher apes and is much less pathogenic than *Ancylostoma*, facts that suggest that it became a parasite of man at an earlier date than did *Ancylostoma duodenale*.

The late Dr. Darling has drawn attention to another problem of comparative helminthology, which he had based on the differing geographical distribution of *Ancylostoma* and *Necator* in man. The former is found in pure culture in Egypt and in Italy; the latter in the southern United States, in South Africa and among the Solomon Islanders and the Polynesians. Mixtures occur elsewhere, but where races mix in unequal proportions one or other species tends to predominate; in Java, for example, where Malays live alongside North Indians who have immigrated within recorded times, *Necator* exists in the former and *Ancylostoma* predominates in the latter, just as in their own countries. Other similar examples are given by Dr. Darling, and from these he draws the suggestive conclusion that two races of anthropoids arose in widely separated geographical areas and that each became infested with a different form of hookworm. That which arose in the Holarctic region—the Mongolian and the Caucasian races—harboured *Ancylostoma* (the form which we have shown is probably of a carnivorous origin), while the Ethiopian-Oriental races (i.e., the negroid) harboured *Necator* (the form which is probably of herbivorous origin).

The name *Necator americanus* is rather a misleading one, as, although it was originally described from America, there is hardly any doubt that it is essentially an African parasite. Its presence in America is probably a legacy from the old slave-trading days.

Returning again to the other common parasites of man, we find that *Ascaris* is more closely associated with forms found in herbivores than with those in carnivores. The human schistosomes, with the perplexing exception of *Schistosoma japonicum*, have their closest relations among the herbivorous animals. The relations of *Onchocerca volvulus* are all in ruminants, Equidæ and similar forms. These examples could be

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multiplied, but this is unnecessary at present. The general result is, however, to show that the parasites of man are in the main of herbivorous origin. When one considers the occasional forms which we now encounter in human beings, it will be noticed that many of these are of carnivorous origin. This seems to suggest that within comparatively recent evolutionary times man has changed his diet, a conclusion which is supported by more strictly anthropological findings.

I have so far neglected the case of the pig, in which there are a large number of forms which resemble, morphologically at least, the species found in man. Which was the original host I am unable to suggest, but the comparison is interesting. Diet may have some bearing on the question—both are very catholic feeders. On the other hand, it is necessary to remember that the pig is probably the most primitive and the least specialized of the animals which commonly surround man. The available evidence suggests that the porcine parasites are biological variants of the human parasite, in some cases at least. This would imply that these forms have only very recently settled down in their specific hosts—too soon to have developed separate morphological characters. In other words, we are here dealing with species in the making.

In this brief review of the relationship between the helminth parasites of animals and man, many important questions have necessarily been omitted. Enough has been said, however, to show that that relationship is a very real and a very important one. The parts played by the different species of animals open up many interesting points for discussion. Such animals as dogs and cats, which are in close association with human beings, and such animals as apes and monkeys, which are closely related zoologically to man, as is to be expected, harbour many similar parasites. The part played by the domestic pig is a very important one, and offers a very severe commentary on many of our human measures, or lack of measures, for the protection of our health. The fact that the other domestic mammals play such a small part in human helminthology only serves to emphasize the part played by the pig.

The following table of the parasites of man is complete except for several very doubtful species; the list of animal hosts, however, is less complete, as new wild hosts will undoubtedly continue to be discovered. It is sufficiently comprehensive, however, to illustrate the close connexion which exists in this respect between man and the rest of the animal kingdom.

HELMINTHES OF MAN AND THEIR ANIMAL HOSTS.

<i>Gastrodiscoides hominis</i>	...	...	...	...	Pig, Napu deer
(<i>Watsonius watsonius</i>)	...	...	...	...	Monkey (= <i>Pseudodiscus hawkesii</i> in elephant ?)
(<i>FASCIOLA HEPATICA</i>)	...	...	...	...	Ruminants, Equidae, pigs, &c. (wild and domesticated)
<i>Fasciolopsis buski</i>	...	...	...	...	Pig (dog, rabbit)
<i>Paragonimus westermani</i>	...	...	...	...	Dogs and cats (wild and domesticated), ox
(<i>Echinostomum ilocanum</i>)	...	...	...	...	?
(<i>Euparyphium malayanum</i>)	...	...	...	...	?
(<i>Echinochasmus perfoliatus</i>)	...	...	...	...	Dog, cat, pig
(<i>Opisthorchis noverca</i>)	...	...	...	...	Dog
<i>Opisthorchis felineus</i>	...	...	...	...	Cat, dog, fox, glutton, pig
(<i>Opisthorchis viverrini</i>)	...	...	...	...	Cat
<i>Clonorchis sinensis</i>	...	...	...	...	Dog, cat, rat, mouse, wild cat, pig, camel, badger
(<i>Pseudamphistomum truncatum</i> (?) )	...	...	...	...	Dog, cat, fox, glutton
<i>Heterophyes heterophyes</i>	Dog, cat, wolf, fox, &c.
<i>Heterophyes nocens</i>	Dog, cat, &c. (Japan) (This species is <i>sub judice</i>)

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<i>Metagonimus yokogawai</i>	Cat, dog, pig
(<i>Stamnosoma</i> (= <i>Centrocestus</i> ?) <i>armatum</i>)	Cat, dog
(<i>Stamnosoma formosanum</i>)	Cat, dog, rat
(<i>Monorchotrema taihokui</i>)	Dog, cat, &c.
(<i>Monorchotrema tachui</i>)	Dog, cat, &c.
(<i>DICOCÆLIUM DENDRITICUM</i>)	Sheep, cattle, pig
<i>Schistosoma japonicum</i>	Ruminants, horse, pig, dog, cat, weasel, rats, mice, rabbits, &c.
<i>Schistosoma hæmatobium</i>	—
<i>Schistosoma mansoni</i>	—
<i>Dibothriocephalus latus</i> (adult)	Dog, cat, &c. (larva in freshwater fish)
(<i>Dibothriocephalus mansoni</i> (larva))	Practically any vertebrate except fish (adult in dog, cat, and wild carnivores)
(<i>Diplogonoporus grandis</i>) (adult)	Sea mammals ?
(<i>Diplogonoporus brauni</i>) (adult)	Sea mammals ?
(<i>Raillietina madagascariensis</i>)	?
(<i>DIPYLIDIUM CANINUM</i>) (adult)	Dog, cat and other carnivores (larva in flea and biting louse)
<i>HYMENOLEPIS NANA</i> (adult and larva)	Mouse, rat
(<i>HYMENOLEPIS DIMINUTA</i>) (adult)	Rat, mouse (monkey, dog), (larva in flea)
(<i>Bertiella satyri</i>) (adult)	Apes and monkeys
(<i>ECHINOCOCCUS GRANULOSUS</i>) (larva)	Practically any mammal (including carnivores) especially sheep, pigs, horse ((adult) fox, dog, cat and other carnivores)
<i>TENIA SOLIUM</i> (adult)	—, (Larva) pig (recorded from car- nivores, &c. ?)
<i>TENIA SAGINATA</i> (adult)	—, (Larva) ox (lama, giraffe, &c. ?)
(<i>TENIA MULTICEPS</i>) (larva)	Sheep, ox (pig, &c.) (adults in dog)
(<i>Tenia glomeratus</i>) (larva)	(Mouse, ?) (adults in dog ?)
<i>Strongyloides stercoralis</i>	Dog, cat, pig
<i>TRICHINELLA SPIRALIS</i>	Pig, rat, &c., &c.
<i>TRICHOCEPHALUS TRICHIURA</i>	Pig, apes, monkeys
(<i>HEPATICOLA HEPATICA</i>)	Rat, dog
<i>ANCYLOSTOMA DUODENALE</i>	Tiger, young dogs and cats
(<i>Ancylostoma caninum</i>) (?)	Dogs, cats, tiger and wild carnivores
<i>Ancylostoma braziliense</i>	Cats, dogs and wild carnivores
<i>Necator americanus</i>	Apes, pig, rhinoceros
(<i>Esophagostomum apiostomum</i>)	Apes and monkeys
(<i>Esophagostomum brumpti</i>)	?
(<i>Esophagostomum stephanosum</i>)	Apes
<i>Ternidens deminutus</i>	Monkeys
(<i>Syngamus kingi</i>)	?
(<i>TRICHOSTRONGYLUS COLUBRIFORMIS</i>)	Ruminants
(<i>TRICHOSTRONGYLUS VITRINUS</i>)	Ruminants
<i>Trichostrongylus orientalis</i>	?
(<i>Trichostrongylus probolurus</i>)	Ruminants
(<i>Mecistocirrus digitatus</i>) (?)	Ox, pig
(<i>HÆMONCHUS CONTORTUS</i>) (?)	Ruminants
(<i>METASTRONGYLUS APRI</i>) (?)	Pig
(<i>Eustrongylus renale</i>)	Dog, pig, &c.
<i>Dracunculus medinensis</i>	Dog, horse, jackal, leopard, monkey
<i>Loa loa</i>	Baboon
<i>Filaria bancrofti</i>	—
<i>Filaria perstans</i>	Chimpanzee
<i>Filaria ozzardi</i>	—
(<i>Dirofilaria immitis</i>)	Dog

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(<i>Gongylonema pulchrum</i>)	Ruminants, pig, &c.
(<i>Thelazia callipæda</i>)	Dog
<i>Physaloptera caucasica</i>	Baboons and other monkeys
(<i>Gnathostoma hispidum</i>)	...	...	...	Pig
(<i>Gnathostoma spinigerum</i>)	...	...	...	Carnivores
ASCARIS LUMBRICOIDES	...	...	...	Pig (monkeys, sheep, cattle)
(BELASCARIS MYSTAX)	...	...	...	Cat
(BELASCARIS MARGINATA)	...	...	...	Dog
(TOXASCARIS LIMBATA)	...	...	...	Dog
(<i>Lagocheilascaris minor</i>)	...	...	...	?
ENTEROBIUS VERMICULARIS	...	...	...	(Monkeys ?)
(SYPHACIA OBVELATA)	...	...	...	Mice

(Parasites the names of which are in *CAPITAL ITALICS* are present in Britain; those with the names in brackets are accidental in man.)

Discussion.—Dr. WILLIAM NICOLL: Dr. Cameron has raised the question as to how man has acquired his helminth parasites. The two most obvious lines along which this may be supposed to have taken place are, first, by environmental circumstances and, secondly, by hereditary influences. The parasites which man has acquired in the former of these ways are chiefly those which he shares in common with one or other of the domesticated animals. Certain of these parasites may pass their adult stage as readily and as commonly in man as in the domesticated animals. Others pass their adult stage in man and their larval stage in animals or occasionally *vice versa*, as in the case of *Echinococcus*. On the other hand we have to consider parasites which may be regarded as in a sense hereditarily acquired, that is to say they are shared by the animals most closely related, biologically, to man, namely the apes and monkeys. Our knowledge of the parasites of the Primates is incomplete, but apparently man has inherited comparatively few in this way—chiefly nematodes. Practically none of the trematode parasites of man are known to occur in monkeys, *Schistosoma hæmatobium* being a doubtful exception. The tapeworm parasites of monkeys are almost entirely distinct from those of man. Amongst the nematodes, however, there are quite a number of species which appear to be common to monkeys and man.

Professor R. T. LEIPER, F.R.S., stated that he considered that three factors had largely influenced the helminth parasites of man; the change in the food of man probably played a large part, while the other two factors were his association with the domestic animals and the existence of pre-human forms. There was some evidence of the latter in *Physaloptera caucasica*, which was found in man and in monkeys in Central Africa. Other African examples were *Ternidens deminutus* and *Oesophagostomum apistomum*, both of which were not uncommon in both man and monkeys. These indicated that at least some connexion other than food and association existed between man and the parasites of monkeys. Specific flatworm infection was probably almost wholly associated with food habits and that would account for the lack of similarity in the platyhelminth fauna of man and the monkeys to which Dr. Nicoll had drawn attention. He had always been surprised that none of the parasites of the horse were ever found in man, and when one considered the long and close association between man and horses this immunity must be classed as one of the everlasting mercies. So far as he knew none of the roundworms of ruminants which infected man in other pastoral countries had ever been recorded from human hosts in Britain. This might of course be due to their not having been searched for. Trichinosis was a disease which undoubtedly produced severe and acute effects in rats, but recent experimental work indicated that it tended to be relatively innocuous to rabbits. One of the most striking of the changes in host relationships of parasites and one which had occurred during the last hundred years was the invasion of the kangaroo by *Fasciola hepatica* following upon the introduction of sheep and cattle into Australia. Referring to a remark made on parasites in Wales, he pointed out that the decrease in human parasites in all large towns was probably due to their efficient water-borne sewage systems. In Wales and mining districts generally infection with roundworms was high, owing to the use of, or failure of, "bucket systems" of sewage. In the Cornish mines he had found not only hookworm infection but also a high incidence of ascaris and oxyuris infection which was due to the necessarily restricted sanitation of the mines. The contamination of the rungs of ladders by stale fecal matter from the boots of the miners seemed a probable source of such infection.

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President—Dr. J. H. SEQUEIRA.

CASES.

Prurigo of Besnier and Rasch in an Adult.

By F. PARKES WEBER, M.D.

THE patient, Mrs. A. W., aged 32, is a married Englishwoman working as a bookkeeper. When I saw her for the first time at the German Hospital on November 17, 1926, she complained of universal itching, and the skin of the whole body, including the face and limbs, was more or less disfigured by scratching. There was no true eczema, but there was a condition of lichenification at the flexures of the elbows and over the forehead, and, to a lesser degree, of neighbouring parts. The forehead was very red. The itching was said to be worse at night on first becoming warm in bed. She was fairly well-developed, not fat, and of active habits. Apart from the itching and skin trouble she had enjoyed good health. The history was that since childhood (about the age of eight years) she had suffered from itching at the bends of the elbows, and that Dr. Graham Little, whom she saw at the Shadwell Children's Hospital, diagnosed the condition as eczema and prescribed malt and cod-liver oil. It was not till about November, 1925, that the itching spread so as to affect her whole body. There was no history of asthma, nor of tuberculosis of the lungs, lymphatic glands, or other parts.

The patient's paternal grandmother was a "martyr to eczema," but lived to the age of 97 years.

On further examination it was found that there was moderate enlargement of the lymphatic glands in both axillæ and (to a lesser degree) in both groins. Nothing abnormal was noted in the thoracic and abdominal viscera, excepting (by X-rays) slight thickening of the hilus-region of both lungs and doubtful shadowing at the right pulmonary apex. A blood-count gave: hæmoglobin, 99 per cent.; erythrocytes, 4,800,000 per c.mm. of blood; white cells, 9,800 (polymorphonuclear neutrophils, 64 per cent.; lymphocytes, 30 per cent.; monocytes, 4 per cent.; eosinophils, 2 per cent.). The urine was free from albumin, sugar and tube-casts. Brachial blood-pressure, 145 mm. Hg (systolic); 88 mm. Hg (diastolic). Wassermann reaction negative. Pirquet's cuti-reaction for tuberculosis negative. Ophthalmoscopic examination showed nothing abnormal. The patient had never been subject to constipation. Menstruation had commenced at sixteen years and had been regular (every three weeks), excepting in connexion with her only pregnancy, 2½ years ago (the child is living and healthy).

Great improvement has taken place by the use of a zinc ointment, containing a little salicylic acid, for the arms, and olive oil containing zinc oxide for the scalp.

The features of the case correspond with the condition described in 1892 by Besnier as "prurigo diathésique," according to the account given by C. Rasch, of Copenhagen, in 1913 (abstract in *Brit. Journ. Dermat.*, London, 1915, xxvii, p. 104). I have never seen marked cutaneous lichenification in the pruritus of Hodgkin's disease ("lymphogranulomatosis pruriginosa"). The general health of the present patient seems to have been good, and the site of the lesions differs from that in Hebra's prurigo. There is no evidence that parasites have had anything to do with the condition. On account of papers by S. Ehrmann (*Beziehungen der ekzematösen Erkrankungen zu inneren Leiden*, Halle, a. S., 1924, p. 40) and others,

48 Weber: *Prurigo of Besnier and Rasch in an Adult*

mentioned by Dr. H. C. Semon, the patient's gastric contents after a test breakfast were examined by the fractional method and found to show extreme hypochlorhydria. A connexion with asthma, or an idiosyncrasy to certain articles of diet (for instance, eggs) has been noted in some cases, but not in this one (cf. K. Baagøe, *Ugeskrift for Læger*, Copenhagen, 1924, lxxxvi, p. 609; abstract in *Brit. Journ. Dermat.*). A lacto-vegetarian diet (after Rasch) is to be tried, or at least a modified diet of the kind.

Discussion.—Dr. J. A. DRAKE asked why Dr. Weber considered this a separate condition, and not merely an adult picture of the ordinary infantile eczema from which the patient suffered from her eighth year. The lichenification would be accounted for by the prolonged irritation and the scratching.

Dr. W. J. O'DONOVAN suggested that Dr. Parkes Weber might try the effect of mercury vapour light on this patient and report results to the Section. He (the speaker) had had a very similar case which had resisted all ordinary methods of treatment for years, and had often been admitted into hospital. The result of a prolonged light therapy was most satisfactory.

Dr. H. C. SEMON said that on the previous day he had seen a case of Hodgkin's disease in which there had been pruritus for two years, but there was no secondary alteration in the skin, nothing visible but ordinary scratch-marks. The doctor had taken it to be scabies, and wanted the diagnosis confirmed.

Dr. G. B. DOWLING said that he had had a case of persistent eczema, of the Besnier type, in an adult, associated with asthma; in this case whole-blood injections and other injections, such as peptone, had had no effect. On a lacto-vegetarian diet in hospital the condition had cleared up quickly. But there had been a relapse soon after the patient was discharged. He (the speaker) had never seen any remarkable result from even six months' treatment with the quartz lamp.

Dr. H. G. ADAMSON agreed that this was a lichenification of the infantile type of chronic eczema; it was unnecessary to give to such cases the name of Besnier's prurigo.

Dr. J. H. SEQUEIRA (President) thought Besnier was right to lift this condition out of the eczema group, as a distinct entity. He (the President) had had several cases of the kind, some of which he had followed up for some years. The patients were highly neurotic, probably because of the prolonged irritation. It was essential to separate this affection from Hebra's prurigo. The condition from which Dr. Weber's patient was suffering was not uncommon in this country, whereas Hebra's prurigo was very rare.

Dr. JENKINS OLIVER said that one reason why this condition, which might begin in infancy, should be put into a separate category, was that, unlike infantile eczema, this persisted. He (the speaker) saw many such cases in a children's hospital, and considered that peptone and arsenic were the two things which had the greatest effect, the peptone used for a considerable time, the arsenic now and again.

Dr. PARKES WEBER (in reply), said he thought that some of the cases in children alluded to by Dr. Drake and Dr. Adamson, were probably of the same nature, but it was important to separate those cases (like the present one) which persisted and became worse. In cases like the present one real eczema was not invariably present, and the condition differed from the popular type of prurigo which was without lichenification at the flexures of the joints. True Hebra's prurigo was probably (in England) even rarer. Dr. Sequeira's handbook was perhaps the only English one in which Besnier's prurigo was given a separate heading. Artificial light treatment might be given a trial later on.

Lupus Erythematosus affecting Fingers only.

By E. G. FFRENCH, M.D.

I HAVE brought this case to demonstrate the rapid healing effect of the ultra-violet lamp. There was some ulceration of the little finger two years ago, treated at the Metropolitan Hospital. The patient said that three months afterwards the ring finger had become affected. On April 3, 1925, he came to St. Bartholomew's Hospital, having purplish patches on both those fingers, and the provisional diagnosis

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was lupus erythematosus. Local treatment of various kinds was carried out, but there was no progress. X-rays in quarter pastille doses were then given once a month. He had eight such doses, but healing was very slow, and at that time there was much ulceration of both fingers. Six weeks ago I began to treat him with ultra-violet rays three times weekly, and healing became very rapid; it is now nearly complete. I do not know whether the condition is lupus pernio.

Microscopic Sections from a Case of Epithelioma developing on Scleroderma (shown at last Meeting).¹

By J. M. H. MACLEOD, M.D., and J. E. M. WIGLEY, M.B.

THE sections were made from the thickened skin and from the edge of the growth, and they corroborate the previous diagnosis.

In the thickened skin the epidermis is not definitely changed, but in the corium there is hypertrophy of the white, fibrous tissue, forming a dense, compact mass, in which, here and there, the blood-vessels can be seen, with a cellular deposit around them.

The section from the edge of the tumour shows spino-cellular epithelioma and an inflammatory cellular deposit, due to ulceration, which seems to have preceded the epitheliomatous changes.

The femoral lymphatic glands, draining this area, were removed at operation. On microscopic section, they showed secondary deposits of epitheliomatous cells.

Dr. J. H. SEQUEIRA (President) said he believed that this association of carcinoma and scleroderma had never been described before.

Lymphoblastic Erythrodermia.

By J. H. SEQUEIRA, M.D. (President).

PATIENT, a male, aged 58, apparently in very good health. Family history unimportant; all the members of the family are dark-skinned. The patient was first seen by my colleague, Dr. Lewis Smith, who was struck by the redness of the skin, and sent him to me. This noticeable redness of the skin has persisted for nine years. There has been no scaling. Irritation has been intermittent, sometimes very slight; it is worse in the winter, when the patient complains of the cold. There is nothing abnormal in the viscera, the Wassermann reaction is negative. Blood-count: Red cells 4,900,000; hæmoglobin 83 per cent.; white cells only 5,000, and of these 65.5 per cent. are small lymphocytes.

Dr. Pantón and I have now investigated a number of these cases, and three points on which we lay stress are (1) the universal redness of the skin; (2) the fact that there is no initial increase in the leucocytes; (3) a change in the relative count, 50 to 60 per cent. being lymphocytes. In the later stages there may be a moderate degree of leucocytosis.

Discussion.—Dr. G. B. DOWLING asked whether in these cases typical lymphatic leucæmia ultimately developed, with a high count of lymphocytes.

Dr. SEQUEIRA (in reply) said that these patients never had a very high leucocyte count; the highest he (the speaker) had known was from 30,000 to 40,000. Some patients had died after showing mental symptoms, others from some intercurrent disease; all the cases had been followed up at hospital for eight or nine years, and apparently none of the patients had recovered.

¹ See *Proceedings*, 1927, xx, Sect. Derm., p. 36

50 Adamson: *Two Cases of Recurrent Cellulitis of the Face***Two Cases of Recurrent Cellulitis of the Face.**

By H. G. ADAMSON, M.D.

(I) J. B., MALE, aged 50. Recurrent erysipelas-like attacks on the face for last ten months. The forehead, the root of the nose and the cheeks are bright red and swollen and the skin over these parts is tense and free from wrinkles. These attacks of redness and swelling have occurred every few weeks without completely subsiding in the intervals. There is a slight rise of temperature (99° F.) during the attacks. Three months ago all the teeth were removed, but the attacks have continued. Nothing abnormal discovered in nose or sinuses.

(II) A. G., aged 19. Recurrent attacks of redness and swelling of the nose and cheeks during the past five years. The attacks at first occurred at intervals of several weeks; now the swelling is constant, with frequent exacerbations. Examination of nose, throat and sinuses and X-ray photograph of jaws have revealed nothing abnormal.

My object in showing these cases is to draw attention to a condition which is not uncommon, but which has received only slight consideration. I use the term "recurrent cellulitis" without knowing whence I have derived it, for there is little or no literature upon the subject and it is not mentioned in most text-books. Dr. Sequeira in his "Diseases of the Skin," refers to these cases as "recurrent erysipelatoid eruptions on the face," but devotes only a few lines to them. The complaint is a serious one, disfiguring, persistent and difficult to treat. Most text-books when discussing "elephantiasis nostras" mention a later stage of some of these cases under the name "leontiasis," and state that leontiasis may be the result of syphilitic or tuberculous infections or may be a sequel of recurrent attacks of erysipelas, but nothing is said about the clinical appearances, course, origin, or treatment of the more acute stages.

From my hospital case cards I find that I have seen about sixty of these cases during the past twenty years, or in other words, that the condition is met with in a proportion of about one per thousand cases of skin diseases. All attempts made to grow a streptococcus or other micro-organism from blood or serum obtained by a deep puncture of an active lesion have been unsuccessful. Examination of teeth, nasal cavities and sinuses has proved negative. So that although we may suppose that these cases are of the nature of a recurrent erysipelas and that the streptococcal infection has gained entrance by some fissure of the skin or from a dental abscess or the nasal mucous membrane, the supposition has never been confirmed.

Various forms of treatment, including streptococcal vaccines, have been tried, but without success. Most patients after attending for months have disappeared. Some have been traced and have been found to have eventually recovered—the attacks having ceased, and without any leontiasis supervening. I have not myself seen one develop into the stage of leontiasis. In regard to diagnosis: these cases must not be confused with angioneurotic oedema or with recurrent dermatitis from an external irritant.

Discussion.—Dr. DRAKE said he believed that Dr. Whitfield referred to the condition in his book, and considered that it was generally associated with some lesion in the nose, mouth or antrum. It was probably a chronic relapsing lymphangitis, and if the local lesion could be found and dealt with, the skin condition would disappear.

Dr. H. SEMON said that he had had a case of the same kind three months ago, occurring in a nurse. The history extended over a year. The cellulitis usually began at one angle of the mouth. He (Dr. Semon) had first had the patient's teeth examined, and in the mirror

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the hospital dentist had showed him a sinus running from the canine tooth. After the extraction of that tooth the patient had had no further attack, though they had previously occurred fortnightly. He (Dr. Semon) believed that there was nearly always a focus of streptococcal infection in these cases.

Dr. W. K. SIBLEY said that some of these cases were diphtheritic in origin, and therefore it might be well to try diphtheria antitoxin.

Dr. F. PARKES WEBER said he did not think non-specific protein therapy (under which term he included intramuscular injections of milk preparations and subcutaneous injections of antitoxic serums) was of permanent use in these cases. These cases were not uncommon, and he preferred the term "chronic lymphangitis"; the essential condition was a blocking of lymphatic vessels, which led to permanent thickening of the parts involved, whether the upper or lower portions of the face, or other parts. He thought that cure did not occur in some cases in which the swelling associated with the "attacks" had not become permanent.

Dr. E. G. FRENCH said that there had been a similar case in St. Bartholomew's Hospital three years ago, the patient being a worker in Smithfield market. The condition was confined to the forehead, the nose, and the cheek below the eyes, and the swelling was so great that a special pair of frames had to be made for the patient's spectacles. Tonsils and teeth were examined, with a negative result. The only successful treatment was by small ($\frac{1}{4}$ pastille) doses of X-rays per month; he had attended for five months, and if there had been a recurrence most probably he would have returned.

Dr. SEQUEIRA (President) said he presumed that Dr. Adamson did not wish to distinguish these cases from those of recurrent cellulitis which ultimately proceeded to elephantiasis. Probably all Members had seen cases of chronic infection about the lip, with recurrent lymphangitis, and ultimately a great deal of thickening. He (the President) recalled a case in which the whole face was enormously swollen, but the focus of infection could not be found, though careful search had been made for it.

Unusual Type of Nævus.

By JOHN T. INGRAM, M.D.

E. S., MALE, aged 13, of Jewish parentage, presented himself at Dr. Sequeira's clinic at the London Hospital in October, 1926.

Nothing of note in past history or family history.

Physical examination reveals nothing abnormal apart from the skin condition. Three years ago spots appeared on front of neck.

The boy now presents a collar of flat-topped, shallow papules round the neck, palpable to the finger, varying in size from a pin's point to a large pin's head, and of a deep reddish-brown colour (figs. 1, 2). This is continued as a faint macular brown mottling of the head and face, the trunk and proximal parts of limbs. These latter spots resemble freckles and are particularly close set behind the ears, round the eyes and in the naso-facial cleft. The mucous membranes, the cheeks and prominence of the chin, the hands, forearms and feet are free. The eruption is said to be extending and to be more prominent in the summer time.

Microscopic examination shows that the papules are formed by infiltration of nævus cells, pigment cells and connective tissue cells.

Discussion.—Dr. GRAHAM LITTLE said he thought the mottling was a sun effect, of the nature of freckles.

Dr. H. G. ADAMSON suggested the possibility of urticaria pigmentosa.

Dr. JENKINS OLIVER said he did not think that this case was one of nævus, it was more like the pigmentation produced by sunlight. The pigment spots appeared to be in relation to the hair follicles. The epithelioid cells, seen in the section, were probably dissociated cells from the lanugo hair follicles.



FIG. 1

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FIG. 2.

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Dowling: *Leiomyoma Cutis*

Dr. F. PARKES WEBER thought that, as the spots became more marked in summer from exposure to sunlight, they were not true nævi, although they were not mere sunlight freckles.

Dr. INGRAM (in reply) said that sections stained with polychrome methylene blue did not show any increase of mast-cells in the dermis; this indicated that the condition was not urticaria pigmentosa.

Leiomyoma Cutis.

By G. B. DOWLING, M.D.

FEMALE, aged 54. This patient began to suffer from polydipsia, polyuria and loss of flesh about six months ago; at about the same time an eruption developed on the right arm and later it appeared on other parts of the body, notably the back



FIG. 1.

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and shoulders; fresh lesions are still appearing at the rate of two or three a week and there are now over sixty lesions scattered about the back, shoulders, trunk and face, varying in size from that of a lentil to that of a pea (fig. 1). These lesions are grouped on the right knee but not elsewhere (fig. 2.) They are little firm elevated tumours situated in the skin, brownish-red in colour and somewhat translucent—rather resembling Boeck's sarcoid. They are all quite painless.



FIG. 2.

Histologically, a well defined mass of smooth muscle-fibres is seen in the corium. The mass is circumscribed but not encapsulated. The smooth muscle-fibres are densely packed and run in solid strands in all directions.

Maculo-anæsthetic Lepra.

By G. B. DOWLING, M.D.

THE patient is a young Siamese student who has been in England for thirteen months. Nine months ago a pigmented macula developed on his right elbow. This lesion has spread peripherally and now measures about 7 in. by 5 in. The pigment has faded centrally and is now heaped up at the periphery of the patch.

56 Little: *Sarcomatosis Cutis*; Semon: *Lupus Erythematosus*

Of more recent development is a darkly pigmented patch on the left forearm just above the wrist. The pigment is just beginning to fade in the centre of this patch. The patch over the right elbow is anæsthetic. There is loss of ulnar sensation and both ulnar nerves are thickened, the right more so than the left.

Considering the grave nature of the prognosis of a nerve case of lepra, and the very small prospect of any benefit from treatment, it is a question whether the patient should receive treatment here, or be advised to return to his own country.

Dr. S. E. DORE said that a year ago he himself had had a similar case, also in a Siamese student, and the diagnosis had been confirmed by X-ray plates showing rarefaction of the bones of the fingers. The patient was employed in the Post Office, having been sent over by the Siamese Government, and he (Dr. Dore) had advised that he should be sent back to Siam, where there was a leper colony. That was done, and no further information had been received about him.

Sarcomatosis Cutis (Type Perrin).

By E. G. GRAHAM LITTLE, M.D.

THIS patient has large pigmented plaques, tending to disseminate extensively over the skin. She had one on the buttock two years ago, and it was then an isolated tumour. It was treated by Dr. Whitfield with X-rays and disappeared, only a scar being left. In the last two years, however, there has been an extensive dissemination of similar lesions, and now there are over fifty of them. They are hypodermic tumours, at first not affecting the skin; later the skin becomes adherent to the subcutaneous tumour, and when that has happened the area of adhesion becomes red. The tumour is a large, red, rosette-like lesion, much larger than it feels. There is no very extensive enlargement of glands. I have not seen one of these cases since the one which I showed before the Section fifteen years ago,¹ and which had been sent to St. Mary's Hospital as a case of apparent primary sarcoma of the skin. In six weeks an immense number of these plaques developed; I prescribed soamin injections—"pushing them"—and all the lesions involuted in an extraordinary way. But the patient died suddenly, whether it was from prolonged arsenical intoxication or from what cause, it was difficult to say. The post-mortem examination revealed nothing definite. He had had a catarrhal attack and a very swollen throat. I have shown to-day a section from one of the most recent tumours we could find, and it shows that infiltration is deep in the capillary layer. The nature of the infiltration is disputed; the authorities at St. Mary's regard it not as sarcomatous, but as endothelial or epithelial in origin, though it is admitted that the diagnosis is difficult. In both the cases, that of fifteen years ago and that of to-day, the clinical features are identical, and a drawing of one might very well do for that of the other. I shall be glad of opinions as to diagnosis and treatment.

Lupus Erythematosus treated by Krysolgan.

By H. C. SEMON, M.D.

THE patient, aged 51, wife of a medical practitioner, was first seen in November, 1925. The lesions were small, of scaly erythematous and cicatrizing type and involved the skin in front and behind both ears almost symmetrically. There was also a more superficial band-like lesion, with little tendency to cicatrization midway between the scalp margin and the glabella. The ears themselves, the cheeks and the nose were unaffected by the disease.

¹ *Proc. Roy. Soc. Med.*, 1910-11, iv (Sect. Derm.), p. 22.

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History.—In China in 1903, two attacks of pleurisy; pulmonary tuberculosis was suspected but not confirmed on her return to England. In 1918 there was an attack of facial erysipelas.

The lupus erythematosus was first noticed in 1923. There was some local sensation of burning and occasional irritation. Frequent headaches accompanied the cutaneous manifestations and there was a tendency to crusting in the right atrium nasi. Washing out the nasal cavity on this side relieved the headaches.

Treatment.—In view of the occasional association of lupus erythematosus with nasal infection, the patient was sent to Mr. Zamora, who diagnosed a chronic sepsis of the right antrum, and performed the radical operation for drainage in January, 1926. This procedure relieved the headaches, but had no effect on the cutaneous condition, and it was therefore decided to administer the vaccine which had been made from the streptococci recovered at the operation. In all, eight injections in rising doses were given between February and April. The patient's husband reported that the last two or three injections seemed to cause malaise, with aggravation of the lesions locally, and the appearance of an evanescent erythematous eruption on the backs of the hands and wrists.

At a further consultation in May, treatment by krysolgan, an organic combination of the gold-thio-phenol group (Schering), recommended in this disease by Martenstein (Breslau) and others, was decided upon, and the drug was administered intravenously in rising doses (seven in all) from 0.0015 gr. to 1.25 gr. every week or ten days. There was no reaction, either local or general, until the last named dose had been reached. The patient then complained of severe "rheumatism" in all her joints, with a feeling of physical weakness and depression.

Her husband could detect no rise of temperature and no albumin in the urine. He noticed, however, that there was increased redness and irritation of all the lesions. The patient, after two days in bed, recovered completely and reported for further control in August. The lesions were then found to be considerably paler, and those in front of the left ear had completely cicatrized, leaving a fine, almost invisible scar with a halo of bluish-brown pigmentation surrounding it. This result encouraged a further trial of the drug, and a 0.75 gr. dose was injected in 1 c.c. of distilled water on September 16. This was the eighth injection since the beginning of the course.

Ten days later the patient reported a moderate recurrence of the rheumatic symptoms, and a return of the focal reaction. There was, in addition, an irritable, diffuse eruption between the fingers, and a few scaly nummular lesions on the waist line, not unlike the secondary rings in pityriasis rosea. The patient had now had 3.0175 grains of krysolgan in all, and it was decided to remit the treatment *sine die*. When she was seen again at the beginning of November all the lesions had completely cicatrized; there was a pronounced feeling of improved general health, and a decided gain in weight. All the secondary cutaneous manifestations, which were presumed to be in the nature of local anaphylaxis from the injections, had involuted without leaving a trace.

The case is interesting as supporting Schaumann's recent view of the ætiology of the "fixed" type of lupus erythematosus, from the therapeutic side. Krysolgan and its analogue sanocrysin have a specific effect on certain types of tuberculous foci, and if the chronic type of lupus erythematosus can be justifiably classified with the benign lymphogranulomata of Sternberg and Schaumann, the successful issue in this case is afforded a rational explanation.

Discussion.—Dr. HALDIN DAVIS said he himself was told by Dr. Semon what he had done, and having a case of lupus erythematosus which did not respond satisfactorily to six intravenous injections of quinine, he had now tried this new remedy for it. The patient had received

two doses, and he (Dr. Davis) had not yet seen the result of the second. After the first dose (0.1 gr. intravenously) he could not say that there had been a local reaction, but she had shown a rash around the waist similar to that described by Dr. Semon, and when she had been seen a fortnight after the injection there was an improvement in the condition. Dr. Schaumann said that he had obtained almost uniformly good results from the use of krysolgan in lupus erythematosus.

Dr. A. M. H. GRAY said that Dr. Goldsmith had been giving injections of krysolgan for him (Dr. Gray) in cases of lupus erythematosus at University College Hospital, and the results were very promising. Small doses, insufficient to cause reactions, had been used. He (Dr. Gray) had seen two cases in America treated by one of Dr. Schamberg's protein gold preparations with very satisfactory results. It was not necessary to use doses large enough to cause reactions.

Dr. SEQUEIRA (President) said that in consequence of the glowing accounts of the remedy he himself had obtained a supply, but as almost immediately afterwards he had read of a fatal result from its use he had hesitated to start with it.

Dr. SEMON (in reply) said there had not been any albuminuria in this case. When albuminuria occurred it was said to be due to the breaking up of tuberculous foci, that it was an excretory phenomenon, and that it disappeared with the continuance of the gold injections. Only one fatal case had been recorded. Martenstein, of Breslau, had treated forty-two cases with the remedy without a fatality, and claimed 66.5 per cent. of permanent cures.

Disfigurement from Tar Impregnation.

By H. C. SEMON, M.D.

THE patient, a healthy youth, aged 18, met with a motor accident in June, 1926. He appears to have fallen in such a way as to have severely abraded the right side of the forehead, right cheek and right corner of the mouth. The superficial scars were a slaty-brown colour, and together produced appearances not unlike the tattoo marks of Pacific Islanders. The condition suggested a trial of extaetol, a chemical caustic of somewhat similar constitution to that of pyotropin. The results after five sessions of treatment were satisfactory enough to encourage a trial of the drug for the removal of genuine tattoo marks, for which it is designed.

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President—Dr. S. MONCKTON COPEMAN, F.R.C.P., F.R.S.

On the Possibility of Reducing the Rate of Mortality from Cancer of the Breast and Cancer of the Uterus.

By MAJOR GREENWOOD, F.R.C.P., and JANET E. LANE-CLAYPON, M.D., D.Sc.

THE *Theætetus* may not be one of the greatest of the dialogues of Plato, but it contains a description of the Socratic method worth the attention of all interested in the problems of cancer. Socrates, it will be remembered, compares his art with that of the midwife.

"For I have this," he says, "in common with the midwives: I am sterile in point of wisdom, and the reproach which has often been brought against me, that I question others but make no reply myself about anything, because I have no wisdom in me, is a true reproach; and the reason of it is this; the god compels me to act as midwife, but has never allowed me to bring forth. I am, then, not at all a wise person myself, nor have I any wise invention, the offspring born of my own soul; but those who associate with me, although at first some of them seem very ignorant, yet, as our acquaintance advances, all of them to whom the god is gracious make wonderful progress, not only in their own opinion, but in that of others as well. And it is clear that they do this, not because they have ever learned anything from me, but because they have found in themselves many fair things and have brought them forth."¹

It has been both our duty and our pleasure for some years to use this method in the study of cancer. We have attempted no researches into the ætiological arcana of malignant disease, we have not presumed to speculate as to the consequences of future improvements of methods of treatment, we are not even—a dreadful confession to be made by users of the statistical method—much interested in the discussion as to whether mortality from cancer is *really* increasing. What we have done has been to question our professional colleagues, that is to say, the writings of our professional colleagues, in order to persuade them to tell us quite plainly what they *can* do to relieve certain forms of malignant disease. And we have also questioned the patients, sometimes directly, sometimes indirectly by the intermediary of the Registrar-General, the Medical Officer of Health, and the staffs of hospitals, so that these patients might tell us to what extent they *have* benefited from the knowledge of the surgeons, and how far this falls short of the degree to which they *might* have benefited. Some results of our humble application of the Socratic method form the topic of our paper this evening. We shall speak only of cancer of the breast and of the uterus, and, as already implied, we only consider the effects of treatment, not indeed within the compass of every medical practitioner but at the command of all operating surgeons—under which title we include gynæcologists—forming a professional class adequate, both qualitatively and quantitatively, to deal with all the cases which occur in this country.

It is our purpose to examine how far in the light of existing knowledge it is possible that a reduction in the mortality-rate may be effected, and how such a reduction is likely to be reflected in the mortality figures for the different sites. No attempt is made to foreshadow the results of improved methods, especially in the use of radium. There are also gaps in the available data, which reduce the exactitude of the conclusions reached, because they render necessary large allowances for possible

¹ See Loeb edition of Plato's works, ii, pp. 34-36.

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errors of calculation. These allowances may be too large and thus tend to an estimate which is unnecessarily unfavourable. But for an assessment of these errors we must await further knowledge.

No account is taken here of any already existing reductions in the mortality-rates due to operative procedures. It may well be that even now there is considerable difference between the incidence- and the mortality-rates, because it is known that a fair proportion of women who are operated upon for cancer of either of these sites, are so effectively treated that they live to die of some other disease, either chronic or acute, affecting other systems of the body. As one of us (M. G.) [1] has elsewhere pointed out, the term "cure" is ambiguous, still it may be used without risk of gross error if the patient survives the period within which the bulk of recurrences occur, and then dies from some other disease. Isolated cases are indeed on record of recurrences occurring at a date later than ten years from operation, and a small proportion of metastases develop at even later periods. Without harping on the word "cure," we propose here to confine ourselves to the experience of ten years after operation, using, however, data of shorter periods in certain instances.

Up to the present no data are available showing the total number of *applicants for treatment* for either cancer of the breast or cancer of the uterus, in the country as a whole. It is at least certain that there is a wide divergence between the incidence-rate and the application-rate. Rough estimates of the divergence are available for cancer of the breast. Data are so far lacking for cancer of the uterus, but there is good reason to believe that they are even less satisfactory than for cancer of the breast. The estimates referred to are for London and for certain towns in the provinces [2]. They were obtained by comparing the total number of deaths corrected for residence by the Registrar-General, with the total number of applicants at the local or metropolitan hospitals over any given year or number of years. Due care was taken to avoid duplication of cases through patients making application to more than one hospital.

The figures about to be quoted are all for periods when radiation was scarcely used, so that it is unnecessary to consider any method of treatment other than surgical. Furthermore, it may be stated that the results obtained with radiation in cancer of the uterus are very similar to those obtained with surgery in other countries, and data on this point will shortly be published by the Ministry of Health. It may be added that data of results at the end of five years from treatment of a series of radiated cases are entirely lacking for this country. Only a few cases under observation for five years, forming part of a series covering shorter periods, have as yet been published here for cancer of the uterus.

In dealing with our subject we propose to assume provisionally that the certification of deaths can be relied upon as showing the primary site of the growth. It will, indeed, be shown later that this is probably not strictly accurate for cancer of the breast, and will perhaps never be so for cancer of the uterus, but it will be well at first to accept the figures given by the Registrar-General as sufficiently accurate for our purpose.

The position then resolves itself into attempting to answer the following questions: What evidence have we as to the extent to which advantage is taken of the treatment at present available, and to what extent may any further use of existing facilities be likely to effect a reduction of the mortality from cancer of the sites under consideration?

Before seeking to answer these questions we lay down two propositions or postulates, both at least plausible and one axiomatic.

(1) It is improbable that any great saving of life will be effected among patients over the age of 70 suffering from cancer.

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In spite of the decided increase in longevity which has occurred during the last fifty years, unless and until some other form of treatment than those known at present is available, it is unlikely that a large proportion of women over 70 years of age will submit to treatment or be regarded as suitable for it.

(2) All cases of cancer have once been early cases and the patient could have been operated upon had she presented herself earlier for treatment, or had the condition been diagnosed earlier.

This last apparently obvious remark seems to be required, because statements not infrequently appear to the effect that a high proportion of inoperable cases is a condition which must be accepted as permanent *without reference to the age of the patient*. The suggestion is, it appears, often based on an erroneous assumption that a large proportion of the patients are really unaware of their condition until the disease is too far advanced for treatment.

A priori, this is a most plausible assumption, particularly with regard to cancer of the breast. It is a matter of common observation that in some women the breast becomes a large unwieldy organ, not very easily explored with the finger, and we know that severe pain is a comparatively rare early symptom of malignant disease, although some degree of pain formed the first or only symptom in 17.7 per cent. of 508 cases [3]. It might be supposed that only careful palpation would reveal the existence of a small tumour, and that it would often happen that a cancer would be for months quite undetectable by the patient. We cannot prove that such a course of events is uncommon. What we can prove to the hilt is that, on the average, a period measured by months does elapse between the recognition by the patient herself of an abnormality and her submission to expert examination. Some of the data have already been published, and more will be published in due course. For cancer of the breast the mean alleged duration is from eight to twelve months, according as the cases of long duration are or are not included. The lump in the breast is nearly always discovered by the patient herself, but very occasionally the complaint is of pain in or near the breast and the lump is only discovered by the examining surgeon. There is a small number of cases in which the growth commences deep in the breast near the chest wall, and in these instances the lump may reach a considerable size before the patient is aware of its existence. Again, in cases of great adiposity a small lump may escape detection, at any rate for a while. But the available data show that these together form a very small proportion of all cases. In the vast majority of cases the patient *does* feel the lump, but allows a considerable time to elapse before making any application for hospital treatment.

In the Leeds data [4], out of 288 cases which could be classified according to the stage of the disease at operation, and in respect of which the alleged duration of the growth was given, only two advanced cases gave an alleged duration of less than one month and only twelve of less than three months. The mean alleged duration of the *advanced* cases of disease, excluding those with a history of over five years' duration, was over fourteen months, over nine months for *medium* cases, and over six months for the *early* cases. The percentages of women giving histories of over one year's duration were respectively 28.7, 23.4, and 16.9 per cent. for the above classes.

The period seven to twelve months probably includes some cases with a much longer duration, since the term "twelve months" is used rather loosely by patients who have forgotten how long ago it was since they first noticed the growth; hence the above percentages are probably too low. The Leeds data have been selected for mention here because they have already been published; other data, available but as yet unpublished, confirm them.

The mean alleged duration of the disease before treatment for cancer of the

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uterus (cervix only) is from six to seven months for this country. In cancer of this site the patient is aware only of her symptoms, of which by far the most common is hæmorrhage; practically all others complain of a vaginal discharge. Pain is sometimes present even in the early stages, but not commonly. The number of patients having neither hæmorrhage nor discharge is very small. It is remarkable how long patients will endure their symptoms without making any apparent effort to obtain relief. No doubt dislike to disclose even to a doctor, abnormalities of the sexual organs is an important factor of delay, particularly among single women. Natural reluctance to face the probability of an operation also probably plays a part.

The mean natural duration of cancer of the breast from the first recorded symptoms to death has been shown to be $3\frac{1}{2}$ years (cf. Greenwood), and of cancer of the cervix to be twenty-one months. If the mean alleged durations before application for treatment be compared with these figures for the total mean natural duration, it will be found that there is little relative difference between the dates of application; the patient suffering from cancer of the breast makes application on the whole somewhat earlier in the course of the disease.

For these reasons we hold it to be proved that there is great *avoidable* delay in the treatment of both cancer of the breast and of the uterus.

Let us next examine the mortality-rates at ages for the two sites.

The mortality-rates for England and Wales for cancer of the breast and cancer of the uterus are shown in a report presented to the Health Section of the League of Nations. The figures were taken for the ten years 1911-1920 inclusive, and tabulated by civil state and age (in quinquennial groups) [5].

For the present purpose we may ignore the civil state, since a consideration of this question would lead us into detail and confuse the main issues. It is sufficient to remark that the death-rate from cancer of the breast is higher, and from cancer of the uterus lower, amongst single than amongst married women when allowance is made for age-distribution.

Certification is not yet sufficiently precise for it to be possible to distinguish between cancer of the cervix and cancer of the body in mortality statistics. Single women suffer little from the former, but are relatively somewhat more commonly affected by the latter than are married women.

MORTALITY-RATES FROM CANCER OF THE BREAST.

In this discussion it is necessary to show the death-rates at the different age-periods and the distribution of these deaths according to the age-period. These results are set out in Table I.

TABLE I.—SHOWING THE TOTAL NUMBER OF DEATHS REGISTERED AS DUE TO CANCER OF THE BREAST IN ENGLAND AND WALES FOR THE YEARS 1911-20, AND THE PROPORTION AT EACH QUINQUENNIAL OF AGE OF SUCH DEATH TO THE TOTALS.

Age period	Total female population at given age-period	Total deaths	Rate per 100,000 per annum	Percentage age-distribution of deaths from cancer of the breast, 1911-20
15-19 ...	1,728,481	4	0.02	—
20-24 ...	1,688,070	14	0.08	—
25-29 ...	1,621,786	114	0.7	0.3
30-34 ...	1,510,479	600	4.0	1.5
35-39 ...	1,411,879	1,783	12.6	4.5
40-44 ...	1,267,830	3,903	26.0	8.3
45-49 ...	1,121,731	4,898	43.7	12.3
50-54 ...	938,792	5,301	56.5	13.3
55-59 ...	759,774	5,260	69.2	13.2
60-64 ...	611,788	4,811	79.0	12.0
65-69 ...	488,811	4,282	87.6	10.7
70-74 ...	346,585	3,986	115.0	10.0
75 and over...	354,699	5,574	157.1	14.0

Total deaths, 39,930, in ten years.

100.0

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The death-rates per 100,000 of population per annum continue to rise throughout life, showing that those of advancing age are in general subject to attack by cancer, and that there is no special age-period which is selected by this disease. It is important that this fact should be clearly recognized.

It is, however, a distressing fact that the course of mortality with advancing age in England and Wales contrasts with that of Holland. Taking the data for married women as most directly comparable, our experience presents three phases. From the age of 35 to 55 the death-rate rises rapidly, then there is a slight slackening of the rate of increase until the age of 70, after which the rate increases rapidly. In Holland the second phase is both prolonged and accentuated; between 55-60 and 65-70 the rate of mortality is constant, and it does not in fact again increase sharply until age 75-80. In Italy the increase with age is steady (but at a much lower level) until 60-65, then there is a faster increase through the next quinquennium, followed by a plateau covering the periods 65-70, 70-74, and then an increase at approximately the rate found in the earlier age-groups. In common with our colleagues on the League of Nations Sub-Committee, we have sought an explanation of these remarkable differences. The Dutch curve does precisely follow the course that we should expect if in Holland earlier and more frequent resort were had to surgical treatment than in this country. But it is right to state explicitly that we have no satisfactory proof that surgical interventions are in fact more frequent or more timely in Holland than in England and Wales. The advantage enjoyed by Dutch women remains therefore an unexplained fact.

The distribution of the deaths in relation to age-period shows that nearly one-half of the total (46.7 per cent.) occurred over the age of 60, and nearly one-quarter of the total (24.0 per cent.) occurred over the age of 70. It is probable that a proportion at any rate of women over the age of 60 are in a physical condition which would render a radical operation inadvisable. We shall probably not be introducing an error giving too favourable results, if we assume that the number of women over 70 who, being operated upon for cancer of the breast, live to die of some other disease, is not greater than that of those between the ages of 60-69 for whom an operation is inadvisable. That is to say, for purposes of numbers we may regard it as unlikely that any reduction of mortality can be effected in 24 per cent. of cases of cancer of the breast, owing either to the advanced age, or to the physical condition of the patients.

TABLE II.—SHOWING THE PROPORTION OF DEATHS OCCURRING AT EACH AGE-PERIOD FOR CANCER OF THE BREAST (REGISTRAR-GENERAL'S FIGURES FOR 1911-20) AS COMPARED WITH THE PROPORTION OF APPLICANTS FOR TREATMENT AT HOSPITALS IN SIX LARGE COUNTY BOROUGH OF ENGLAND AND WALES.

Age-periods	Hospital cases		Registrar-General's figures, percentage of total (from Table I)	
	Number	Percentage of total		
15-19	0	0.0	—	—
20-24	4	0.4	—	—
25-29	9	0.9	0.3	—
30-34	39	4.0	1.5	—
35-39	89	9.2	4.5	—
40-44	159	16.5	8.3	—
45-49	186	19.3	12.3	—
50-54	162	16.8	13.3	—
55-59	147	15.3	13.2	—
60-64	83	8.6	12.0	—
65-69	59	6.2	10.7	—
70-74	18	1.9	10.0	—
75 and over	9	0.9	14.0	24.0
	964	100.0	100.0	

This supposition is confirmed by a study of Table II, in which is set out the age-distribution of just under 1,000 women operated upon for cancer of the breast in

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six large provincial hospitals in different parts of the country. Only 2.8 per cent. of all the applicants were over 70 years of age, as compared with a death-rate distribution of 24.0 per cent., and only 17.6 per cent. were over 60, as compared with 46.7 of the death-rate distribution. In order to make full allowance, it may be assumed that 25 per cent. of all deaths are at present irreducible on account of age or of the physical condition of the patient.

It is probable that the increasing longevity is responsible in considerable measure for the increasing *absolute* number of deaths from cancer of the breast. Seeing that the curve of mortality rises throughout life, the more elderly spinsters there are in the population the greater will the total mortality from cancer of the breast be likely to be.

MORTALITY-RATES FROM CANCER OF THE UTERUS.

Following the same line of argument as for cancer of the breast, it is shown in Table III that the death-rate from cancer of the uterus remains roughly constant from the age of 60 onwards, with a slight tendency to fall over the age of 75. In age-distribution the figures are 38.0 per cent. over 60 years and 14.4 over 70. The corresponding percentages for hospital applicants are 17.1 and 2.1 per cent. respectively. See Tables III and IV.

TABLE III.—SHOWING TOTAL NUMBER OF DEATHS REGISTERED AS DUE TO CANCER OF THE UTERUS IN ENGLAND AND WALES FOR THE YEARS 1911-20, AND THE PROPORTION AT EACH QUINQUENNIAL OF AGE OF SUCH DEATHS TO THE TOTAL NUMBER.

Age-period	Total female population at given age-period	Total deaths	Death-rate per 100,000 per annum	Percentage age-distribution of deaths from cancer of the uterus during 1911-20
15-19	1,728,481	14	0.08	—
20-24	1,688,070	47	0.3	0.1
25-29	1,621,786	253	1.6	0.6
30-34	1,510,479	897	5.9	2.2
35-39	1,411,879	2,171	15.4	5.4
40-44	1,267,830	3,948	31.1	9.8
45-49	1,121,731	5,447	48.6	13.6
50-54	998,792	6,166	65.7	15.4
55-59	759,774	5,932	78.1	14.8
60-64	611,788	5,197	85.0	12.9
65-69	488,811	4,287	87.7	10.7
70-74	346,505	3,030	87.4	7.5
75 and upwards	354,699	2,784	78.5	6.9
		40,173		100.0

TABLE IV.—SHOWING THE PROPORTION OF DEATHS OCCURRING AT EACH AGE-PERIOD FROM CANCER OF THE UTERUS (REGISTRAR-GENERAL'S FIGURES FOR 1911-20) AS COMPARED WITH THE PROPORTION OF APPLICANTS FOR TREATMENT AT A LONDON HOSPITAL.

Age-period	Hospital cases		Registrar-General's figures, percentage of total from Table III
	Number	Percentage of total	
15-19	0	0.0	—
20-24	3	0.4	0.1
25-29	10	1.3	0.6
30-34	42	5.6	2.2
35-39	80	10.7	5.4
40-44	106	14.2	9.8
45-49	119	16.0	13.6
50-54	143	19.2	15.4
55-59	115	15.5	14.8
60-64	76	10.2	12.9
65-69	56	7.5	10.7
70-74	12	1.6	7.5
75 and over	4	0.5	6.9
	746	100.0	100.0

Note.—In this table the cervix and corpus cases have been added, since cancer of both these sites is included in the Registrar-General's figures. The number of cervix cases was 581, of corpus cases 165, both samples being consecutive series taken over the years 1901-20 inclusive, i.e., over 20 years; full data of these cases will be published separately.

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The data for hospital cases are not absolutely comparable with those for cancer of the breast. The women with cancer of the uterus include many admitted to the wards for examination, but found to be in an inoperable condition, whereas the patients with cancer of the breast had all been operated upon. No data are available to show the number of women who are already suffering from inoperable cancer of the breast when they make application for treatment, because the out-patient records of past years are either admittedly unreliable or have been destroyed. Similarly for cancer of the uterus, it is reasonably certain that a further number of patients with inoperable disease apply for treatment, but are not even admitted to the wards for examination on account of their hopeless condition.

Cancer of the uterus offers a somewhat more favourable age-distribution than cancer of the breast. On the same basis as for cancer of the breast it may be assumed that in only 14.4 per cent., or say one-seventh, of all cases can no reduction be effected in mortality on account of age.

Statements have been made in the past, and are still heard occasionally, that the prognosis in cancer is worse in younger women than it is among older ones. The available data all contradict this assumption, although an exception must perhaps be made in cancer of the breast if there is an associated pregnancy. Probably also the puerperium has an adverse effect. In cancer of the uterus pregnancy has a slightly favourable effect, but the puerperium is disastrous. Collected data on this point for cancer of the cervix are about to be published.

TABLE V.—SHOWING THE NUMBER AND PERCENTAGE OF SURVIVALS AFTER THE RADICAL OPERATION FOR CANCER OF THE BREAST, ACCORDING TO THE AGE AT OPERATION (ADAPTED FROM TABLE XXXVIII IN REPORT 28 [6]).

<i>A.—After Three Years.</i>			
Age-period	Number of cases	Number alive	Per cent. alive
20-29	14	7	50.0
30-39	109	53	48.6
40-49	260	131	50.4
50-59	224	96	42.9
60-69	137	60	43.8
70-79	44	22	50.0
	788	369	46.8
<i>B.—After Five Years.</i>			
20-29	11	3	27.3
30-39	67	27	40.3
40-49	183	72	39.3
50-59	151	57	37.7
60-69	90	28	31.1
70-79	28	9	32.1
	530	196	37.0

TABLE VI.—SHOWING THE NUMBER OF RECURRENCES UNDER FIVE YEARS IN OPERATED CASES OF CANCER OF THE UTERUS, ACCORDING TO AGE-PERIOD. (DATA WILL SHORTLY BE PUBLISHED.)

Age-period	Number of cases	Number of recurrences	Per cent. recurrences
20-29	2	0	0.0
30-39	53	18	34.0
40-49	242	109	45.0
50-59	345	139	40.3
60-69	238	105	44.1
70-79	54	19	35.2
	934	390	41.8

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Some data throwing light upon the matter are set out in Tables V and VI, and have been collected from the literature. The figures for cancer of the uterus are given only as the number of recurrences, and the percentage survivals cannot be taken merely as the difference between 100 and the tabulated figures, since it is uncertain how the operative mortality has been treated. It is, therefore, unjustifiable to compare directly the two tables, although the results at each age-period in each table are comparable for that table. It is thus shown that such difference as there is, is rather in favour of the younger women.

It seems, therefore, that disability from the point of view of age is found only at the latter end of life.

No appreciable error is likely to be introduced if we assume that 75 per cent. of all victims of cancer of the breast, and 85·8 per cent. of all victims of cancer of the uterus, are theoretically capable of being operated upon.

At this point it is necessary to consider the sites apart, because there are many important points of difference between them, and also there is some divergence in the nature of the available information.

THE POSSIBILITY OF REDUCTION IN THE MORTALITY FROM CANCER OF THE BREAST.

The first question requiring investigation is the proportion of women affected with cancer of the breast who apply for treatment. Under the term "treatment" is implied effective treatment, namely, treatment which, if conditions are suitable, shall effect a permanent removal of the disease. This treatment can at present only be obtained in hospitals or in other specially-equipped institutions. Cancer operations should be left in the hands of skilled surgeons who are constantly practising the procedures. Information as to a previous operation is sometimes given on the death certificate, but is not compulsory. Hence, the only way of obtaining any estimate of the number operated upon is to compare the average number of deaths, corrected for residence, in any area with the number of persons operated upon, due regard being had to duplication, as explained above.

Unpublished data obtained from the large metropolitan hospitals show that not more than 50 per cent., and perhaps only 30 per cent., of all women dying from cancer of the breast in the County of London have been operated upon, or indeed appear to have made any application for treatment at a hospital. But, as already stated, the out-patient records are admittedly unreliable. It is not possible to say to what extent the patients were treated by their own practitioners.

Similar figures obtained from five large towns in England show that the figures, while roughly similar, are slightly better than those for London. About 45 per cent. of the number of persons dying from cancer of the breast appear to be operated upon yearly in these areas combined. It must, of course, be remembered that these figures over-estimate the percentage by the number of those operated upon who do not die of the disease, but it is not possible to take this into consideration until the data available are more complete. It is at least evident that a great many women die without obtaining, or even seeking, radical treatment. Some of these are clearly among the older women, in respect of whom it has been assumed that no improvement can be expected.

We now come to consider the results of treatment, which alone can cause a reduction in the mortality-rate.

A detailed study of consecutive cases, definitely confirmed microscopically as cancer, has been made and published in respect of 357 patients operated upon in the Leeds hospitals. It was shown that the results varied greatly according to the stage

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of the disease at the time of operation. If no extension of the disease beyond the breast could be found either at operation or, preferably, when confirmed by subsequent microscopic examination of the glands of the axilla, then about 80 per cent. of these patients were alive and well ten years after operation. A negative result of the clinical examination of the axilla before operation is valueless and cannot be accepted for purposes of classification, unless by chance the case has stood the test of time and the patient is free from recurrence many years afterwards. The precise percentage of survivals of ten years varies somewhat with the method of calculation. But 80 per cent. survivals, after deducting those dying from causes other than cancer under ten years from operation, may be accepted as a figure reasonably near the truth, and this figure is confirmed by the experience of other individual surgeons. Passing to the other classes, among patients with invasion of the axillary glands, only about 5 per cent. were found to be alive at ten years after operation.

TABLE VII.—NUMBERS OF SURVIVORS AFTER OPERATION (CANCER OF THE BREAST) COMPARED WITH THOSE UNDER OTHER CONDITIONS.

Period of survival	(a) Early operation (87 cases)	(b) All classes of operated patient (357 cases)	(c) Untreated patients (natural duration) (651 cases)	(d) English Life Table No. 8. (Women. Age of entry, 55 years)
	Number surviving	Number surviving	Number surviving	Number surviving
0 ...	1,000	1,000	1,000	1,000
1 ...	966 ± 19.6	773 ± 22.2	831 ± 14.7	984
2 ...	943 ± 25.0	591 ± 26.0	553 ± 19.5	967
3 ...	897 ± 32.7	487 ± 26.4	344 ± 18.6	949
4 ...	826 ± 40.9	397 ± 26.0	238 ± 16.7	930
5 ...	826 ± 40.9	357 ± 25.8	161 ± 14.4	910
6 ...	783 ± 45.9	321 ± 25.8	120 ± 12.7	889
7 ...	766 ± 48.1	278 ± 25.9	—	867
8 ...	746 ± 60.6	267 ± 26.0	—	843
9 ...	707 ± 55.1	246 ± 26.0	—	819
10 ...	687 ± 56.9	235 ± 25.9	—	794

In the above Table VII, from Report No. 34 on Public Health and Medical Subjects, we set out in survivorship form, making allowance for errors of samples, the survivors at the end of one, two, etc., up to ten years from operation, (a) of women operated upon in the stage of local disease, (b) of all women operated upon radically, (c) of all women affected by cancer of the breast and not radically treated, (d) of the general population of women, starting at the mean age at which the cancer patients were treated. Here all deaths, whether from cancer or not, have been included, so that the 70 per cent. of ultimate survivors, actually 68.7, is not in contradiction with our estimate of 80 per cent., reached by deducting deaths from other causes than cancer. It will be seen that the number of survivors after operation, under the most favourable circumstances, is almost 87 per cent. of the normal number of survivors, while if all cases together are taken it is less than 30 per cent., and where there is no treatment at all, practically zero. Now we know that many patients are not operated upon at all, early or late, so that if we assume that the adoption of early radical treatment would reduce the mortality in the proportion of 13 to 70, i.e., in the proportion of (100-87) to (100-30), we are not very likely to over-estimate the gain, although from the nature of the case this cannot be an exact estimate.¹ It would amount to a reduction of mortality of 81.5 per cent. This would amount, applied to the deaths under 70 in the decennium 1911-20, to a saving of nearly 25,000 lives. Let us even suppose that the Leeds results are too favourable to the extent of twice the standard

¹ For a different method of approximation, see [1] p. 21.

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error, that the per mille survivors should be not 687 but 573. Even so the gain would amount to nearly 60 per cent., or more than 18,000 lives. We do not indeed suggest that so great a reduction as implied by the former estimate is practically possible. We have not forgotten the possibility that some proportion of cases may really be both undiagnosed and undiagnosable at an early stage. We do not claim for all surgeons the skill and experience of those whose results have been analysed. We are aware that persons in remote country districts cannot be persuaded to resort at once to hospitals perhaps fifty miles away. When all these objections are admitted, it still seems to us not unreasonable to suggest that, without any accession of scientific knowledge whatever, the annual deaths from cancer of the breast might be reduced to half the numbers which actually occur.

THE POSSIBILITY OF REDUCING THE MORTALITY FROM CANCER OF THE UTERUS.

The published figures of mortality include, as we have noted, cancer of both cervix and corpus without separation. Cancer of the corpus uteri has a longer mean duration than cancer of the cervix, and the results of operation are much more favourable. Since we can make no distinction, we must assume that all the mortality is due to cancer of the cervix, with the result that our estimates of the extent of possible reduction are too unfavourable—an error, however, on the right side.

No estimate has as yet been made of the extent to which women suffering from cancer of the cervix fail to make any application for treatment. It is probable that the percentage is even higher than for cancer of the breast, but no figure can yet be given. It is known that there are a great number of women who only make application for treatment at a stage of the disease when operative measures can no longer be undertaken with any hope of success. The percentage of the total cases varies, but for the operation of abdominal hysterectomy it stands at about 48·9 per cent. on a large number of cases. Clearly the estimate of the operability varies with the opinion, and perhaps the skill, of the individual surgeon; the above figure is that obtained by massing the data in the entire literature on this point. Full details will shortly be published.

In this country Berkeley and Bonney [7] report an operability of 63 per cent. on 214 operated cases, and data, not yet ready for publication, obtained from a London hospital, show an operability of 52·8 per cent. of all applicants admitted to the wards. It is probable that some patients whose condition in the out-patients' department is found quite hopeless have escaped inclusion, but this cannot be determined. If we add the two sets of figures—Bonney's and the hospital's—together we obtain an average operability of 56·8 per cent., which is above that for the massed cases in the literature.

This figure, the implications of which are sufficiently tragic, is certainly not the full measure of the position. As just explained, we have no data as yet giving an idea of the number who *never* make application for treatment.

If now the results of operation be considered, we shall obtain an estimate of the possibilities of treatment in reducing the mortality. Data for results ten years after abdominal operation have been published quite recently by Bonney, and there are at the moment no further data available, although some will shortly be published, and it is possible to make an estimate based on the results after five years, of which there are large numbers to hand.

Bonney's figures show a survival-rate of 34·0 per cent. on all operated cases at ten years, after deducting those not traced and those dying of causes other than cancer under ten years. The number of cases having a recurrence of the disease in his hands

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between five and ten years is 11.1 per cent., a figure which is much higher than that for the known recurrences after five years in other series. Bonney does a very complete operation, and the excellence of his results makes it clear that the high figure of recurrences between five and ten years is due to the increased prolongation of life secured by his work, and not to a high total number of recurrences among his patients.

The figure for known recurrences among patients surviving five or more years varies round about 3 per cent. of all the known recurrences. Recent figures published from Leeds [8] give a percentage of recurrences of 6.2 per cent. after five years, all cases not operated upon completely being deducted. It will probably be safe to take 5 per cent. as a reasonable allowance for recurrences after five years, as a general figure.

The number of survivors five years after operation is known in a very large number of cases. Taken from the literature there are 3,506 operated cases after deduction of patients not traced and dying from other causes within five years. In these 1,317, or 37.6 per cent., of the patients were alive after five years. Allowing a further percentage of five for recurrences after five years, we have a survival-rate of 32.6 per cent. at ten years, which is slightly less than that actually obtained by Bonney.

This figure could at once be greatly improved if the operative mortality could be reduced, and also if patients came up for treatment at an earlier stage of the disease. It will be simpler to take the latter point first. It is difficult to be sure of the exact stage of the disease by clinical examination only. Evidently the degree of mobility of the uterus will give much information, but this may be obscured by old inflammatory trouble in the appendages, so that comparatively early cases may appear to be more advanced than they really are. Again, cancer of the cervix frequently spreads by direct extension only, and there is no invasion of the glands, even at the time of death from the disease. On the other hand, cancer cells may pass to the nearest lymph nodes, or even to more remote ones, at a comparatively early stage, so that a case apparently very early, from the clinical point of view, may in fact already have metastatic deposits. Hence, it is not possible to classify the cases on clinical examination only. Still, as a whole, it may be said that the shorter the duration of the symptoms the earlier the stage of the disease and the greater the chance of permanent relief. It is quite safe to say that if all patients came up early, and there were no reduction in the operative mortality, not less than 10 per cent. improvement would accrue, so that 42.6 per cent. at least would be the survival figure at ten years.

But if this were the position there would undoubtedly be a further reduction from an improvement in the operative mortality. The mean operative mortality, as found in the mass figures in the literature, is 17.3 per cent. on all cases, excluding palliative ones. Experienced surgeons have succeeded in reducing their operative mortality to about 8-10 per cent., and Bonney estimates that if all cases were early or moderately early the mortality might be reckoned at 10 per cent. This is a little more favourable than the average actually deduced from the literature, but the data are not really numerous and probably do not represent the best that can be done. There has been some general reduction in operative mortality during recent years, so that it will probably not be taking too favourable a view if 7.3 per cent. be allowed for a reduction of operative mortality by an improvement in the stage of the disease at which patients presented themselves. Hence, by a combination of the anticipated reductions due to the stage of disease being early instead of, as now, often very late, we may expect an improvement of not less than 17.3 per cent. on the present survivals at ten years. This we took to be 32.6 per cent. Under improved conditions with existing methods, therefore, the survival rate of those women operated

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upon (or treated with radiation) under the age of 70 might fairly be reckoned as some 50 per cent. ($32.6 + 17.3$) of all cases.

We have seen that 14.2 per cent. of all deaths are of women over 70, so that we are anticipating a reduction only in 85.8 per cent. of all cases. These amounted in the decennium 1911-20 to more than 34,000. If half were saved, it would mean 1,700 a year.

If some method could be found which would further reduce the operative mortality to that found in cancer of the breast, which is less than 3 per cent., the figures would improve still further. There are some indications that this may occur, as the attention of those concerned is much occupied with the still high mortality from the operation. The majority of the women die from some form of sepsis, and if means can be found, either by pre-operative radiation, or by inoculation, or other means of disinfection, to reduce this, it seems certain that the mortality-rate would fall further. We have pointed out that our calculation for cancer of the breast involves a speculative element. *A fortiori*, the present estimate is open to objection because the available data are still less complete; we claim no more than to have reached a figure of the right order of magnitude, one that does not grossly overstate the practical possibilities of the situation.

Reference has been made in the early part of this paper to the possible errors of diagnosis or of entry on the death certificate. So far as can be ascertained from papers already published, the error of diagnosis for cancer of the sites here considered, as shown by a comparison of the clinical and post-mortem (microscopical) findings, is about one-half that found in other medical and surgical cases. In cancer of the breast the error appears to be about 10 per cent., in cancer of the uterus about 20 per cent., whilst in other medical and surgical cases the error amounts to 40 per cent., or more.

In cancer of the uterus the error is chiefly in the diagnosis of cancer on microscopically non-cancerous cases, but as microscopical reports can hardly be expected for the majority of certified deaths, no attempt can be made to assess the magnitude of the error for the country as a whole.

In cancer of the breast the errors of diagnosis are mostly in the direction of under-statement. It is much commoner for a lump in the breast to be diagnosed as non-malignant, and a partial operation undertaken, than for a radical operation to be undertaken for a non-malignant case. The clinical error of diagnosis in the early stages of the disease was found, in an investigation made by the Ministry into the antecedent conditions of cancer of the breast [3], to be 19.0 per cent. in hospital cases, and over 42 per cent. among private practitioners. These evidently occur almost entirely among the early cases, but many of the patients died as a result of the wrong diagnosis, and that among early and therefore favourable cases. The errors of death certification are not comparable with those made clinically in early cases of cancer of the breast. But the point is of importance practically, and from a further aspect which is referred to immediately.

There is almost certainly considerable error in the death certification of the primary source of a cancerous growth, which is to some extent inevitable, and which must lead to erroneous conclusions as to the site mortality. The error arises in the case of those women who, having been operated upon for cancer, die of a metastasis in some other part of the body without any local recurrence of the growth. The death certificate may be given as of cancer of the site of the metastasis and not as that of the primary growth. This error is probably more common with cancer of the uterus than with cancer of the breast. In cancer of the uterus the medical attendant may be aware that there has been a hysterectomy, but, unless he has known the patient's history, or the patient herself knows that the hysterectomy was

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performed for cancer, there is nothing to show definitely that the fatal growth was secondary to a primary growth in the uterus. Hence the medical certificate may easily be in error as to the primary site.

This source of error has been noted in an inquiry now being made into the fate of patients operated upon for cancer of the uterus. Among just over 100 death certificates of women known to have been operated upon for cancer of the uterus, certainly thirteen, and perhaps seventeen (the identity of one or two is still doubtful), have been entered as deaths from primary cancer of other sites. In the majority of these cases the patient died some years later than the operation, and in a different place and therefore under a different doctor. No blame for the error can be attributed to the doctor who signed the certificate. In the absence of any local recurrence, and unless the patient were quite sure that she had been operated upon for cancer, a worse error might be caused by assuming that the hysterectomy had been undertaken for cancer. Hysterectomy is practised for a variety of troubles, of which cancer is only one. Already it appears that the error arising from this cause is in the region of 13 or more per cent., and it will probably increase. The greater the number of persons operated upon in the early stages, so that the whole local and regional cancer is removed, the greater is likely to be the number of cases in which this error occurs.

The error from this source in cancer of the breast should be less, but recent investigations show that it is not very different from that for cancer of the uterus. If a radical operation has been performed it is reasonably certain that it has been for cancer. The number of cases in which a radical operation is mistakenly undertaken for a non-malignant growth is not great, and with the reverse error the patient commonly has a local recurrence. Hence the error is not likely to be great, if cancer of other sites in persons having had a radical operation on the breast is assumed to be secondary to cancer of the breast. The earlier the operation for cancer is carried out, the less likelihood is there that there will be either a recurrence or a metastatic growth. This point is discussed to show that the death-rates from cancer of any site are not necessarily absolutely reliable.

With regard to the feasibility of early operation upon a much greater number of persons than at present, it is not without importance to remember that for each inoperable case in an institution occupying a bed for perhaps several months, many patients could have been successively accommodated in that bed for a radical operation. Increased demand for operation does not necessarily imply an increased demand for beds in institutions.

We have now given reason for holding that, in the existing state of the art of surgery and postulating no revolutionary improvement of that art, it is quite possible to save annually many thousands of lives. The means are there to be used if we choose. The end of a paper is not the place, nor indeed are we the persons, to discuss how these means are to be made really available, or what are the respective rôles of administrative action, popular education and education of the general medical practitioner. But we are certain of one thing, that surgeons as a whole have tended to despond overmuch of the possibilities of their art in the treatment at least of these forms of malignant disease, and that the Socratic questioning, not of a particular surgeon but of the whole of the adequate literature, is really enabling the profession to find "many fair things and to bring them forth." It is indeed strange that in this practical land so few serious attempts to strike a balance of profit and loss in surgical procedures have been made. No doubt scientific book-keeping of this kind would bring to light foul things as well as fair things, but until it has been done,—and obviously it cannot be done by a few persons or in a short time,—it cannot be said that the medical profession has really done all it might do for the information of the general public.

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In these days medical research, if not exactly a lucrative, is at least a highly respectable profession. There is certainly no difficulty in persuading young people to embark upon researches involving the use of complicated and costly apparatus, and not very much difficulty in financing their operations. But if one were to suggest to such an aspirant that months in a medical library or the offices of a hospital is a particularly valuable form of research,—even if it never leads to admission to the Royal Society, it is odds that he would imitate Naaman the Syrian. It is high time that somebody as tactful as and more influential than Naaman's servant should again ask: "If the prophet had bid thee to do some great thing wouldest thou not have done it? How much rather then, when he saith to thee, Wash and be clean?" Not, indeed, that to wash and be clean is really so small a thing. It may not need much apparatus but it does require a great deal of patience, a healthy scepticism and a good deal of common sense, the last a quality not always conspicuous in the works of our young researchers.

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Discussion.—Sir JAMES BERRY (President of the Society) said that he would not discuss the paper in detail, but he was sorry that such an important contribution had been read before only one Section, and not at a joint meeting of several Sections such as the Section of Surgery and the Section of Obstetrics and Gynaecology, as well as the Section of Epidemiology and State Medicine. The communication was of the greatest value. He congratulated the Section and thanked Dr. Lane-Claypon and Dr. Major Greenwood for this important piece of work.

Mr. SAMPSON HANDLEY said that the paper to which they had listened was a searchlight on the subject with which it dealt. The incredible amount of work involved in it was very impressive, and the facts it revealed showed that the settlement of statistical problems in surgery was not a task for the individual surgeon. These problems must be attacked by the pooling of the resources of Governments and by the work of specialist statisticians. This paper took us to the world of hard facts, and as so often happened the facts when faced were found to be encouraging and to provide a basis for useful effort in the future.

In some ways he thought the authors took too pessimistic a view, they considered that prolongation of life was not likely over the age of seventy as the result of operation. He (the speaker) believed, however, that old persons nowadays stood operation well, owing to improvements in methods of anaesthesia and increased gentleness in operating. About thirteen years ago he operated on a lady of over eighty for breast carcinoma; the disease recurred in the neck and the supra-clavicular glands were excised. This lady remained well thirteen years later at the age of 94.

He referred to the unexpected fact emerging in the paper that in only 50 per cent. of cases of breast cancer did the patients ever apply for treatment. The public and many doctors had inherited an unreasoning pessimism as to the results of the treatment of cancer.

At first sight it seemed strange that the presence or absence of enlarged axillary glands should make such a difference to the prognosis after operation, but the involvement of the axilla was a mere index to a more subtle form of spread of the disease to the internal mammary glands, which lay inside the thorax along the internal mammary artery.

In the paper it was truly pointed out that operable cases were less costly in beds than

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inoperable cases. This had been recognized by the authorities of the Middlesex Hospital, who, some years ago, changed two inoperable wards into wards for the operable cases.

He (Mr. Handley) had found that in cases of breast cancer which he saw privately, an average delay of five months occurred between the patient's knowledge of the lump and her first visit to seek advice. The suppression of this delay was the most important object to aim at, at present, and it could only be attained by the education of the public. The facts they must know were few and simple, and one in particular being that early cancer was painless. The public thought that no lump could be cancer unless it were associated with pain.

Mr. Handley then referred to the work done by the Middlesex Hospital with a view to education of the public. He did not think that the objection that such educational efforts might cause alarm and do more harm than good was a sound objection. As some American writer had said, it was better to be frightened than dead.

In conclusion, he (the speaker) said that the authors had encouraged those who were occupied in the treatment of cancer.

Dr. S. WYARD said that too much stress should not be laid on diagnosis at an early stage of the disease. Cancer was at first a local disease, but did not remain so for long, and it was improbable that it was any longer local in the majority of cases by the time that diagnosis became possible. It was unlikely that diagnosis would ever be possible at an earlier stage than it was at present.

There was little hope that education, whether of the general or medical public, would have much effect. Ignorance could not be dissipated by compulsory education, still less by voluntary education, nor was ignorance alone the cause of preventing early application for advice. The medical profession was already educated as much as could be expected. It was difficult to conceive any way in which administrative action could be of service.

Dr. W. CRAMER said it was clear from the paper and from the discussion that there was a general agreement between statisticians, clinicians, and pathologists, that reduction in the mortality from cancer of the breast could be effected if operation were resorted to when the disease was recognized at a sufficiently early stage. The term "early" really meant at the time when the disease was localized. The more localized the disease, however, the more difficult it was to diagnose it clinically with certainty. An operation might often be necessary to distinguish at that early stage conditions which were malignant, or potentially malignant, from those which were merely hyperplastic. It would be interesting to know how many, in the series of cases on which the paper was based, had been diagnosed with certainty as malignant before operation.

Dr. MCCANN said that in order to reduce the mortality from cancer of the breast and the uterus it was obvious that the disease should be recognized at an early stage. With regard to uterine cancer he had for many years emphasized the following points: (1) All irregular uterine bleeding demanded a careful pelvic examination. (2) Excessive bleeding at the menopause should rouse suspicion. (3) Uterine bleeding after the menopause should be assumed due to cancer until the contrary is proved. He (the speaker) suggested that all women over thirty-five should be examined annually and that special attention should be paid to the breasts and uterus. He believed that cleanliness was a preventive of cancer, since dirt led to chronic irritation. He expressed the opinion that the greater frequency of cancer of the cervix uteri among the poor was due to cervical injuries followed by infection and uncleanness. The provision of an improved maternity service was accordingly a matter of great importance. Cancer of the body of the uterus yielded better post-operative results than cancer of the cervix, and statistics as to cancer of the uterus would be more valuable if the two sites were differentiated. He believed in the existence of "pre-cancerous states," e.g., the thickened enlarged cervix fissured by many small tears, often found in multiparous women. Such a cervix in a woman aged 40 or above should be treated by supra-vaginal amputation. This practice would undoubtedly prevent the development of some cases of cancer. The significance of adenomatous polypi in the cavity of the uterus seemed to have been overlooked. These polypi, which were frequently removed in curetting, were often early indications of cancer.

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Sir WILLIAM HAMER said that he had been, he confessed, surprised at the pessimism expressed by some of the speakers that evening. It was a curious fact, when the isolation of scarlet fever came into vogue, many years ago, and when, thereupon, there ensued a great decline in scarlet fever mortality, that there was reluctance to attribute the benefits accruing, in part, to the hospital isolation. In a similar way the effects of early hospital treatment in measles had perhaps not been given all the credit it deserved (*see* London Annual Report, 1925, pp. 98-103). In influenza, too, the principle of withstanding the beginnings was applicable. He (the speaker) thought the paper read that evening made out a clear case also as regards securing the earliest possible surgical treatment in cancer of the breast and uterus.

Dr. S. MONCKTON COPEMAN (President) said that the authors in their most interesting and valuable paper had for the first time indicated, statistically, the position as to the measure of permanent advantage obtainable in cases of cancer of the breast and uterus as the result of sufficiently early diagnosis and of efficient surgical operation thereby rendered possible. And further they had afforded indication that under these circumstances, as the outcome of better knowledge on the part not only of the general public, but also of the medical profession, a notable saving of life might be expected to result in the future, apart from the possibility of further improvements in surgical technique, or of successful results from other than surgical treatment.

It was in the infirmaries that the end results in cases of cancer, whether previously operated upon or not, usually came under observation. The patients were at the present day not infrequently admitted at a stage when they were practically moribund. In his experience the male cases had for the most part been operated upon at some previous date, but of the women, a not inconsiderable proportion were found to have delayed consulting a medical man until it was too late for operation to be attempted with any probability of success. The reason for this delay in consultation was stated by them to be the dread of having their suspicion of cancer confirmed, and of being then told that an operation was essential.

Medical men also were often loath to make a definite diagnosis of cancer so long as any reasonable doubt could be said to exist as to the actual condition of affairs. And those present, as specialists, were not agreed as to the extent to which it was possible definitely to diagnose cancer in the earliest stages. The best hope of obtaining accurate information lay in the introduction of a serological test of a really dependable nature. To this end a considerable amount of experimental work was being carried out at the present time with definite promise of eventual success.

Dr. LANE-CLAYTON and Dr. GREENWOOD briefly replied to the discussion.

Letter by Jenner and Portraits of Francis Home, of Edinburgh (1719-1813).

Shown by Fleet-Surgeon W. E. HOME, M.D., R.N.

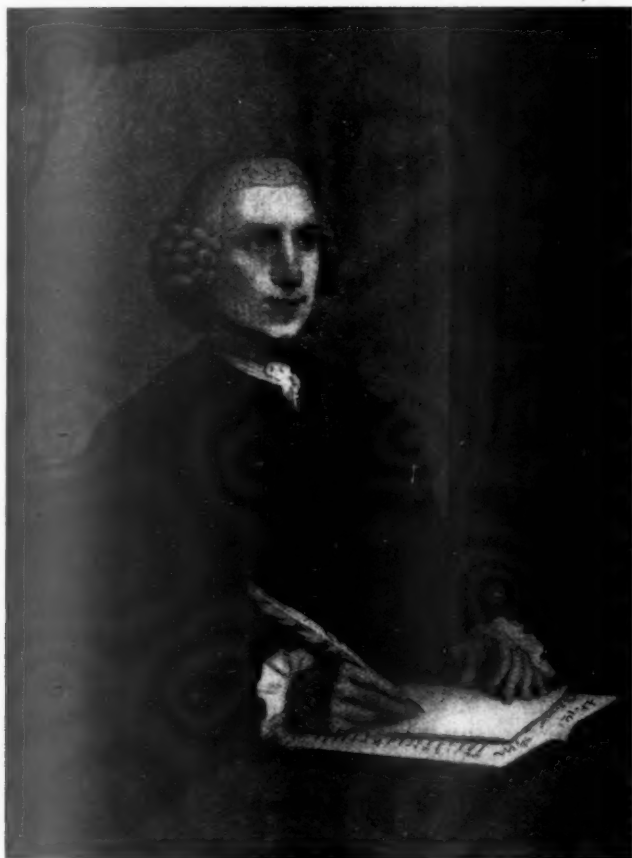
Fleet-Surgeon W. E. HOME, M.D., R.N., showed interesting exhibits consisting of a letter by Jenner and portraits of Francis Home of Edinburgh (1719-1813), and gave a short account of the career of the latter. Francis Home was of interest to the Section of Epidemiology in having made use of a form of active immunization against measles which apparently produced a mild attack of the disease. No evidence is available, however, as to its efficacy as a preventive beyond the fact that Home continued to recommend it.

Under the names of "croup" and "angina maligna" he gave a good description of laryngeal and faucial diphtheria respectively and recommended bronchotomy for the former.

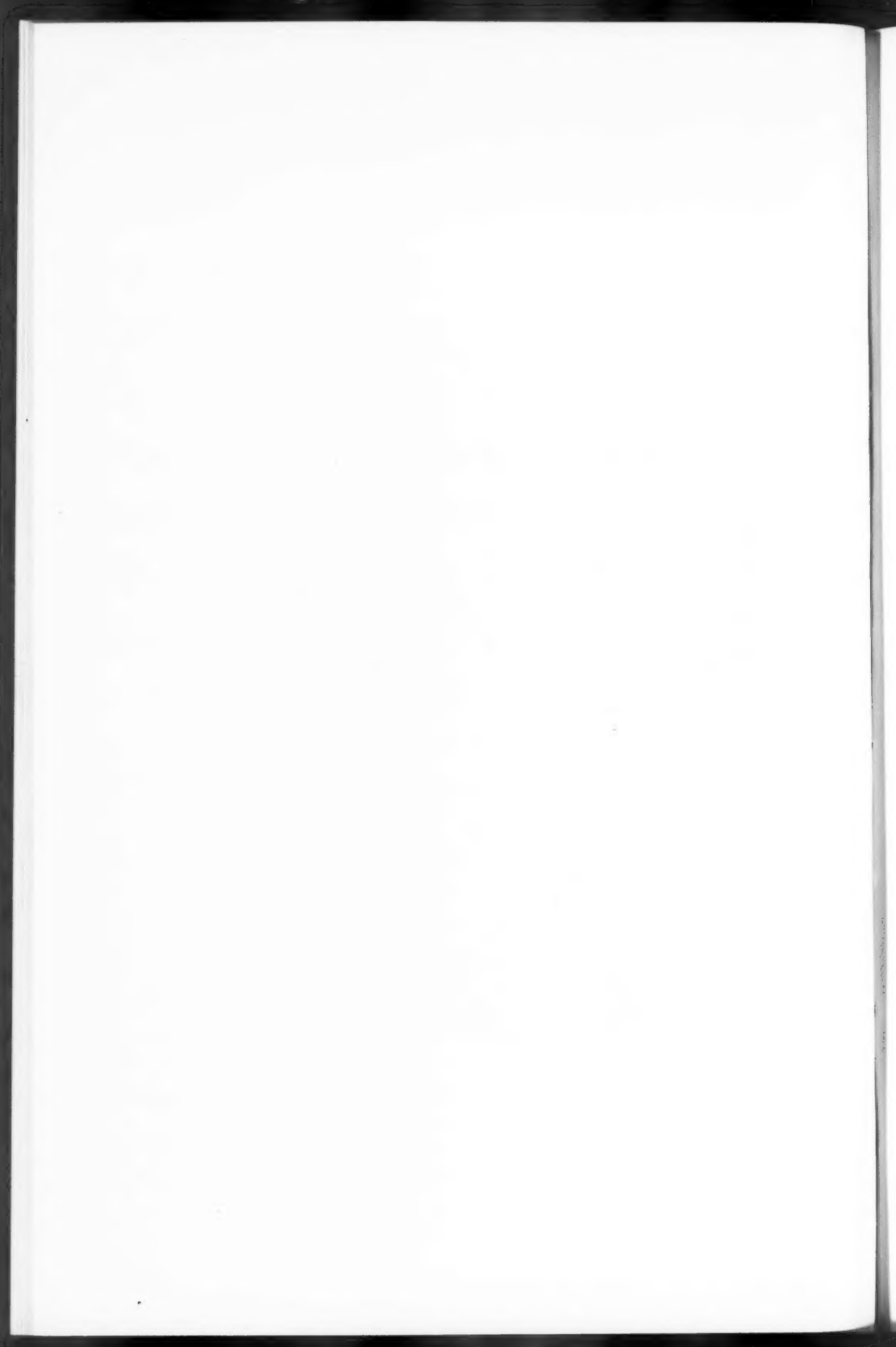
Dr. J. D. ROLLESTON, while deprecating any idea that Home was the discoverer of diphtheria, expressed the thanks of the Section to Fleet-Surgeon Home for his interesting exhibit and remarks.

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Francis Home, of Edinburgh (1719-1813).



Section of the History of Medicine.

President—Mr. WALTER G. SPENCER, O.B.E., M.S.

Eighteen Letters written by Edward Jenner to Alexander Marcet between the Years 1803-1814, presented to the Library of the Royal Society of Medicine by Dr. William Pasteur.

Shown, with remarks, by WALTER G. SPENCER, M.S. (President).

I EXHIBIT the letters, which will be carefully mounted, along with a typed copy for more general use. The letters taken together have an important bearing upon Jenner's statements concerning the pox of domestic animals and human smallpox. These have received recently abundant confirmation. I will give extracts from the publication of authoritative observers, followed by extracts from Jenner's original publications, supplemented by his opinions included in Baron's *Life of Jenner*. Whilst adding to Jenner's "happy foresight," recent observers have confuted opponents, whether among Jenner's contemporaries, or among those who, in later times, have sought to undermine the general use of vaccination.

Dr. William Pasteur, a great-grandson of Alexander Marcet, in presenting these letters, said that they had remained buried in Marcet's voluminous correspondence, and were only discovered shortly before the war. Marcet endorsed each letter "Dr. Jenner," with the date, but the correspondence between Jenner and Marcet has hitherto remained unknown. Moreover, it is of special interest to this Society, seeing that Marcet was one of its founders and Jenner an original member.

EXTRACTS FROM RECENT PUBLICATIONS.

The Milroy Lectures, by the late J. C. McVail, President of the Section of Epidemiology, have been supplemented by a gift through his daughter to the Library of his collection of literature relating to vaccination. In 1892 Guarnieri discovered that the inoculation of vaccine lymph into the cornea of rabbits resulted in a cellular proliferation. Further observations have proved that this vaccinia inoculation of the rabbit's cornea has a constant result in the production of "Guarnieri corpuscles." Hence this reaction has come to supply the place of the undiscovered micro-organisms, assuming such to be the cause of the disease.

In 1914, the Dutch mobilization gave De Jong the opportunity of studying an epizootic of pustular stomatitis and dermatitis in 300 requisitioned horses. In France and Germany the disease of horsepox had received a confusing number of names, a common term in France had been "*eaux aux jambes*" in reference to the complicating oedema of the legs. Horses inoculated from those so diseased exhibited a pustular eruption in the mouth, and on the skin, and the horses so inoculated were proved to be immune to vaccinia inoculation. Rabbits were inoculated from the horses; in the inoculated cornea typical Guarnieri corpuscles were produced. Inoculations were passed from horses through a series of rabbits and calves until the lymph received the approval of the vaccination authorities. Then nine children were successfully vaccinated from the lymph.

Tayora experimented with material from a special epizootic of sheepox, also with goat- and swinepox material. He inoculated a series of rabbits, controlling the effects by the corneal microscopic reaction, until he had produced, particularly from the sheep-pox virus, a standard lymph. When approved the lymph was used for vaccinating children with success.

18 Spencer: *Letters from Edward Jenner to Alexander Marcet*

The reports by Gordon and Ledingham prove that monkeys may be inoculated with human smallpox of all degrees of virulence from confluent smallpox to what has been termed alastrim. After the virus has been passed through a series of monkeys, a calf may be inoculated from a monkey, and from the calf a standard vaccinia lymph obtained.

The rabbit is peculiarly susceptible to inoculation with vaccinia lymph; on the other hand it is relatively insusceptible to inoculation by smallpox virus. So susceptible to vaccinia is the rabbit that an acute encephalitis may be set up and cause death in four to seven days; also an acute rhinitis, by infection of the nasal mucous membrane. If beforehand a rabbit's testis is punctured several times by a sterilized needle, then, upon the introduction of vaccinia lymph into a vein, a special focus of vaccinia develops in the punctured testis. Inoculation from rabbits affected by generalized vaccinia into a monkey or man produces only the typical local lesion of vaccinia, with no tendency to generalization.

Thus there has accumulated experimental data to show that the naturally occurring pox in animals can be passed over and become modified into what Jenner called *variola vaccinae*, or cowpox.

EXTRACTS FROM JENNER'S WORKS.

Jenner's *Inquiry* (1798) commences:—

The deviation of man from the state of nature has led him to associate with a great number of animals, which circumstances have proved a prolific source of disease—the cow, the hog, the sheep, and the horse. The horse from its state of domestication is frequently subject to what farriers have termed "the grease," which after it has been modified by passing through the cow bears a strong resemblance to smallpox, and may be the source of that disease. In the dairy country, men employed both in looking after horses and milking cows infect the cows from pustules on their fingers, and from the infected cows dairy-maids, who do not attend to the horses, are infected. In Scotland and Ireland, where only women milk cows, and the men do not, there is no cowpox.

The first case quoted:—

Case I.—A farm servant attended horses with sore heels. He also milked cows. The cows became infected. This had never happened before on the farm. No fresh cow had been introduced. No other milker attended horses. The man had sores on his fingers. Twenty-five years later he with his family were inoculated with smallpox. He was the only one in which the inoculation failed, although repeatedly inserted, nor did he acquire small-pox, although exposed to the contagion.

Baron's *Life of Jenner*, i, p. 242.

The skin of the horse is subject to an eruption of a vesicular character, which vesicles contain a limpid fluid, showing itself most commonly in the heels. The legs first become oedematous, and then fissures are observed. The skin contiguous to these fissures, when accurately examined, is seen to be studded with small vesicles, surrounded by an areola. These vesicles contain the specific fluid. It is the ill-management of the horse in the stable that occasions the malady to appear more frequently in the heels than in other parts; I have detected it connected with a sore on the neck of a horse, and on the thigh of a colt.

Jenner's last observations on horsepox were made in 1817 (Baron's *Life of Jenner*, ii, p. 226).

The disease was traced on a farm, from a horse to the farmer, from the farmer to two or three of his milch cows, from the cows to a young milker, from his hand to the hand of a man, from the man to an infant, and so through other men and women for eight months, when it became mixed with other matters. Proof was obtained of the patients being duly protected against variolous inoculation. There was also confirmation by other observers.

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Jenner, years previous to the publication of the *Inquiry*, had observed a mild epidemic of smallpox, which had some connexion in the popular mind with swinepox—*Inquiry*, 1798, pp. 54, 55, also the *Preliminary MS. in the Library of the Royal College of Surgeons*, pp. 39, 40, and *Baron's Life*, i, p. 129.

There are certainly more forms than one, without considering the common variation between the confluent and the distinct—in which smallpox appears in what is called the natural way. About seven years ago a species of smallpox spread through many of the towns and villages of this part of Gloucestershire. It was of so mild a nature that a fatal instance was scarcely even heard of, and consequently so little dreaded by the lower orders of the community that they scrupled not to hold the same intercourse with each other as if no infectious disease had been present among them. I never saw nor heard of an instance of its being confluent. The most accurate manner, perhaps, in which I can convey an idea of it is by saying that had fifty individuals been taken promiscuously and infected by exposure to this contagion, they would have had as mild and light a disease as if they had been inoculated with variolous matter in the usual way. The harmless manner in which it showed itself could not arise from any peculiarity, either in the season or the weather, for I watched its progress upwards of a year without perceiving any variation in its general appearances. I consider it then a variety of smallpox.

Now there is in the MS. in the Library of the Royal College of Surgeons a sentence omitted from the *Inquiry* :—

It obtained the name among the nurses and the common people (I know not why) of the swine-or pigpox.

The foregoing may explain why Jenner, in November, 1789, inoculated his eldest son, Edward, then aged 1½ years, with swinepox matter. The child sickened on the eighth day, and a few pustules appeared, corresponding to the inoculation of smallpox matter when the disease is very slight. Variola matter was afterwards inserted at five or six periods without the slightest inflammation being excited. In March, 1792, he again inoculated his son, fresh from the pustule of a child who had had smallpox pretty fully in the usual way. An inflammation appeared the same evening around the incision which at the end of twenty hours had increased to the diameter of a sixpence, and some fluid already had collected, which the child rubbed off, but nothing further occurred.

JENNER'S EARLY AND LATE OPINIONS.

Inquiry, p. 52 :—

May it not then be reasonably conjectured that the source of smallpox is morbid matter of a peculiar kind, generated by disease of the horse, and that accidental circumstances may have again and again arisen, still working new changes upon it, until it has acquired the contagious and malignant form under which we now commonly see it making its devastations among us. And from a consideration of the change which the infectious matter undergoes from producing a disease on the cow, may we not conceive that many contagious diseases now prevalent among us may owe their present appearance, not to a simple, but to a compound origin.

Baron's Life of Jenner, ii, 30, from one of Jenner's Journals :—

The origin of smallpox is the same as that of cowpox; and as the latter (cowpox) was probably coeval with the brute creation, the former (smallpox) was only a variety springing from it. It will be inquired (if the foregoing reasoning be *a priori* correct), in what way can the action of cowpox (or the equine pox) in preventing subsequent smallpox be reconcilable with the established laws of the animal economy? My reply is, for the reasons which I have stated on the basis of facts, that they were not *bona fide* dissimilar in their nature, but on the contrary identical. On this ground I gave my first book the title of "An Inquiry into the Causes and Effects of the Variolæ Vaccinæ," a circumstance which has since been regarded by many as the happy foresight of a connexion which was destined by future evidence to become more warranted.

20 Spencer: *Letters from Edward Jenner to Alexander Marcet*

Alexander Marcet (1770-1822) was Physician to Guy's Hospital. He, Yelloly and Astley Cooper are regarded as the real founders of the Medical and Chirurgical Society. Marcet's friendship with Jenner had the result that Jenner joined the Society as an original member. Marcet served as Foreign Secretary and Trustee, he made several communications to the *Transactions*, and, upon the report of his death, the Society paid Founders' Honours to his memory. His widow presented his portrait by Raeburn, which hangs in the Council Room alongside those of Yelloly and Astley Cooper.

His biography has been written by Sir Norman Moore in the *Dictionary of National Biography* and by Sir Archibald Garrod in *Guy's Hospital Reports* for October, 1925.

For most of his time Marcet lived in St. Mary Axe, close to Astley Cooper, and in the Library of the Royal College of Surgeons is Marcet's MS. "Hospital and Practice Case Book for the period 1804—Autumn 1817." It has a general interest, for many of the cases were seen in consultation with Astley Cooper. I have extracted notes of the cases relating to smallpox and vaccination.

Page 65, October 11, 1805. An extraordinary case of fatal cowpox seen with Astley Cooper, viz., septic infection following inoculation with mixed cowpox and smallpox virus.

Page 72. Queries printed by the Committee of the Medical Council of the Royal Jennerian Society for inquiring into the nature and evidence of supposed adverse cases of vaccination.

Page 127. Letter to the College of Physicians dated December 3, 1806, on the subject of vaccination, which "I have, within the last few months, collected from various parts of the Continent."

Page 227, March 31, 1809. Cases of smallpox simultaneous with cowpox, an instance of mixed cowpox and smallpox inoculation. The child, aged 1 to 2, remained unharmed and healthy.

Returning to the subject of the Letters, Marcet only published extracts from the first two letters dated February 23 and April 6, 1803, respectively, in the *London Medical and Physical Journal*, 1803, vol. ix, pp. 464-466. Except for this, there is no reference to the correspondence in any of the literature concerning Jenner.

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Section of Laryngology.

President—Dr. ANDREW WYLIE.

Foreign Body removed from Right Bronchus.

By FRANK ROSE, F.R.C.S.

A METAL collar stud removed from the right bronchus of a man twelve years after inhalation. [X-ray photographs demonstrated bronchiectasis in the same patient.]

Mr. Rose said that the case had been under the care of Mr. J. E. H. Roberts, and he (the speaker) was merely called in to remove the collar stud. The presence of the collar stud was not suspected until it was discovered by X-rays. The patient then remembered having swallowed it twelve years earlier. The chest symptoms had developed slowly after the accident, and when they had reached a severe stage, the chest had been examined by X-rays, but the stud had not been seen and a later skiagram had also failed to show it, but at a third X-ray examination the collar-stud was found. It was easily located at the operation; it was black, and was so deeply embedded in granulations that its edge could not be seen. The instrument with which he had tried to grasp it had slipped three times; he then tried a different grip, and it was successful. Owing to the right phrenic nerve having been divided, the foreign body remained almost stationary, and that fact probably rendered the extraction easier.

Discussion.—Mr. TILLEY asked whether the patient had clubbed fingers or toes. The most illustrative case of this kind he had seen was in a bronchiectatic patient who "swallowed" a mutton bone, which he (the speaker) removed. There was a history of more than three years of cough following the accident, and the man had become very emaciated. Within six weeks of the removal of the bone eleven pounds had been gained in weight. The case was published in the *Lancet*, April 22, 1911.

Mr. A. J. M. WRIGHT (Bristol) asked whether these cases were really as rare as was supposed. In view of the reports from America was it not likely that some of them were missed.

Dr. IRWIN MOORE said the rarity with which a collar stud accidentally passed into the air and food passages might be estimated from the records (up to 1925) of foreign bodies dealt with at Chevalier Jackson's Clinic in Philadelphia. Out of a total of 1,400 foreign bodies there had been fourteen collar studs, of which two had been impacted in the larynx, four in the bronchi and eight in the oesophagus. All had been removed by peroral endoscopy. One death had occurred, from accompanying pyopneumothorax. A short résumé of those in the bronchi was of interest in connexion with the case now recorded.

(1) Patient aged 18. Right stem bronchus ten years. Fixed in fibrosed area below stricture. Extraction. Cure. Time, one hour. Patient in perfect health one year later.

(2) Patient aged 46. Left stem bronchus twenty-six years. In abscess below fibrous tissue occluding bronchus. Extraction. Cure. Time, thirty-five minutes. This was the longest sojourn of any bronchoscopically removed foreign body.

(3) Patient aged 14. Lead collar stud. Left inferior lobe bronchus ten years. Stricture, granulations. Extraction. Cure. Time, 11 min. 2 sec. Stud firmly embedded in granulations.

(4) Patient aged 7. Admitted moribund with left pyo-pneumothorax. One lung collapsed, and at least one-fourth of other lung out of service, leaving only three-fourths of one lung with which to breathe. Kept alive on table by oxygen through bronchoscope. Collar stud found in an area of ruptured bronchus deep down in right lower lobe. Extraction. Time, 4 min. 17 sec. Intercostal drainage left side five days after bronchoscopy. Death one week later.

[Dr. Irwin Moore showed, by the epidiascope, a drawing of a larynx exhibited in the Museum

10 Rose: *Foreign Body from Right Bronchus*; Wood: *Parotid Tumour*

of the British Medical Association Meeting at Bath in 1925.] This had been removed from a child, aged two years, admitted to the West London Hospital with difficulty in breathing. The diagnosis made was diphtheria. Tracheotomy was performed and diphtheria antitoxin administered. At the post-mortem examination a collar stud had been found impacted in the larynx between the ventricular bands and vocal cords.

Sir JAMES DUNDAS-GRANT referred to a case which he had shown at Bath in which a collar-stud had been removed from the bronchus of a boy, having been there for about a year before it was discovered. There had, therefore, been a latent period, such as that to which Chevalier Jackson had drawn attention. Probably this was the reason the foreign body had been so long overlooked.

Mr. A. J. HUTCHISON said that about sixteen years ago he had failed to extract a pencil cap from the chest of a boy aged seven. He had lost sight of the boy, until two years ago when he was brought into hospital with pneumonia on the opposite side. The foreign body had remained in the lung fourteen years, quite forgotten. It was accidentally discovered two years ago, still causing no symptoms.

Mr. ROSE (in reply) said that clubbing of the fingers had been found in this patient. He believed that in this country cases of bronchiectasis caused by a foreign body occurred in which the foreign body was not discovered or located, and that was one reason why he showed the specimen. The bronchiectasis in this patient was steadily increasing, his health was very poor. A week after the operation no change had occurred, except a slight decrease in the quantity of sputum. Mr. Roberts did not anticipate that a complete cure would result.

Postscript.—The patient reported on December 6. The sputum was reduced to 7 drm. in twenty-four hours, whereas before operation there had been 6 oz. in a single fit of coughing. His general health had greatly improved and he had resumed smoking.

Specimen (with Microscopic Slide) of a Parotid Tumour, probably arising in the Right Supratonsillar Fossa.

By C. G. RUSS WOOD, O.B.E., F.R.C.S.

C. D., MALE, aged 21. Two years ago had right peritonsillar abscess, which was opened. Did not attend hospital again until three months ago, when on examination a very hard, smooth mass the size of an orange was discovered on the same side. It could be felt behind the angle of the jaw, and there were a few enlarged glands on the same side. The examining finger could only just reach the inferior pole, and when operating I was under the impression that the mass was a new growth of the tonsil, because no digital evidence of the latter could be made out after the growth was enucleated. Within a week the tonsil slowly arose from below where it had been pushed by the growth. The growth weighed just over 2 oz. Report of microscopic examination: "Mixed parotid tumour, with an unusually large amount of cartilage formation."

Discussion.—Dr. DAN MCKENZIE said that this was the third specimen of the same pathological kind presented to the Section during the last year. He considered that the prognosis was good if the tumour was shelled out complete, as in this case, and if there was no deposit in glands. In the case he (the speaker) had shown last year the patient had undergone a series of misfortunes. He (Dr. McKenzie) had tried to shell the tumour out, but it was fixed to the ramus of the jaw, so he inserted a tube of radium with which he had provided himself. The operation was performed through the mouth, and the operation area had become very septic; septicæmia developed with a high temperature, and the patient looked very ill. He (the speaker) had then applied diathermy, which was known to destroy sepsis, and the result was good; the temperature came down, the sepsis disappeared, and the remaining part of the tumour left shrivelled up. A further application of the diathermy caused the whole tumour to disappear, and up to date there was no sign of recurrence.

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Mr. G. WILKINSON said that radium had a good effect on these tumours when they recurred. Three years ago he (the speaker) had had a case of parotid tumour which had recurred after having been removed by a surgeon, and he had embedded in the growth a small one-mille curie tube, which had caused its complete disappearance up to the present time.

Mr. W. H. JEWELL reminded members of a case he showed at the last meeting.¹ The report on the tumour was that it was a mixed parotid, locally malignant. Usually these did not cause secondary growths. He had meant to insert radium but healing had been too rapid to allow of his doing so at the time. He intended, however, to do so later as the growth had extended through the capsule and was intimately adherent to the mastoid process of the parotid gland.

Mr. E. D. D. DAVIS brought for renewed inspection a specimen he showed a year ago, that of a mixed parotid tumour which had presented in the palate in a case sent to him as one of sarcoma. There had been a small mixed tumour in the parotid gland twenty years previously, and the surgeon who removed it had burst the capsule and said it might return. If the capsule remained intact and the tumour was completely removed, recurrence was rare. It was now two years and nine months since the removal of the growth now shown and there was no sign of recurrence. (See *Proceedings*, March 6, 1925.)

Mr. RUSS WOOD said that the pathologist's report was that the tumour consisted of practically solid cartilage; radium would be useful if there was a recurrence.

Tumour of Larynx: for Diagnosis.

By GEORGE W. DAWSON, F.R.C.S.I.

PATIENT, aged 58, female, married.

History.—Tightness of throat began last Christmas; later, difficulty in breathing and laryngeal stridor. Has been treated for asthma. Wassermann negative. There is a smooth, round tumour covered by normal coloured mucous membrane, situated below the right vocal cord. Both vocal cords and arytenoids move well. Voice normal.

Discussion.—Dr. IRWIN MOORE said that he considered this growth to be enchondroma of the larynx, growing from the internal perichondrium. Tracheotomy should be performed, followed by splitting of the larynx, and removal of the growth. This should be done before the growth became larger.

Mr. BARWELL said he also thought this was enchondroma, and that it appeared to be growing round the lumen of the larynx, as there was a swelling in the left subglottic region. He thought that removal could be effected in one operation by laryngo-fissure.

Dr. KELSON remarked that no one had suggested thyroid tumour, though occasionally these tumours occurred in this region.

Mr. E. D. D. DAVIS said that this was an enchondroma similar to that in a case recorded by Mr. Waggett. It had a slightly lobulated appearance, the vocal cord was just above it, and a smooth, normal-looking mucous membrane covered the growth. The growth should be attacked from the outside of the larynx; the tumour should be dissected away and the mucous membrane of the larynx left intact. Either tracheotomy would have to be done first, or intertracheal ether used as the anæsthetic.

Dr. W. JOBSON HORNE thought that the condition could not be due to perichondritis, as there was such free movement of the arytenoid cartilages and vocal cords. He regarded it as a diffuse subglottic growth that would require an external operation.

Mr. DAWSON (in reply) said he thought that the growth was an enchondroma. It was not quite round, like a cyst, and small vessels crossed its surface. He (the speaker) would pass a probe down, using cocaine; he would do it when the patient was in hospital. He thanked Mr. Davis for the suggestion that the growth should be attacked from the outside; probably he (Mr. Dawson) would operate through the wing of the thyroid.

¹ See *Proc. Roy. Soc. Med.*, 1927, xx (Sect. Laryng.), p. 8.

12 Ridout: *Diffuse Tuberculosis*; Layton: *Tumour of Upper Jaw***A Case of Chronic Diffuse Tuberculosis of Nose, Pharynx, Epiglottis and Larynx.**

By C. A. S. RIDOUT, M.S.

MRS. E. B., aged 54. History of aphonia, long-standing, also of some previous operation on nose twelve or thirteen years ago in London; is very deaf. Nose externally thickened and reddened; large area of septum destroyed and granulations present on remainder and on outer walls of nasal cavities, also small granulation areas on posterior pillars of fauces and on pharyngeal wall. Epiglottis extensively involved by proliferating granulomatous mass extending to the left arytaenoid. The interior of the larynx is also extensively covered with granulations extending as low as the true cords. A specimen removed for pathological examination from the epiglottis shows a few typical giant cells. Physician's report shows extensive dullness, bronchial breathing and deficient air-entry right side of chest, but no adventitious sounds. Radiograph shows enlarged glands in thorax and infiltration of right lung. There is also a history of old eye trouble with ulceration of left lids. Wassermann reaction negative.

Discussion.—Sir JAMES DUNDAS-GRANT said that the nose should be kept as aseptic as possible, since he was sure that the primary seat of disease was there, and to the nose treatment should be mainly directed. Treatment might consist in using peroxide of hydrogen, and packing the nose so as to separate the crusts, douching afterwards and freely using nitrate of mercury ointment mixed with paroline—"Lack's fluid." The galvano-cautery should be applied to each little patch or nodulation found. Galvano-cautery punctures into the epiglottis would do good. Artificial sunlight might be applied to the body in general, but to a small area at first. Ultra-violet rays must be used with discretion; he (Sir James) had known them to be followed by considerable reaction.

Mr. J. F. O'MALLEY said that he had had one striking case under observation two years in a child of 12 suffering from lupus of the upper gums and septum. She attended University College Hospital, where Dr. A. M. H. Gray was carefully touching the gums with acid nitrate of mercury, and he (the speaker) was using the same treatment for lupus of the septum. The condition seemed to improve after each application, but the margin appeared again, and further applications had to be made. Six weeks ago ultra-violet ray treatment had been begun, and the area on the septum had now quite cleared up.

Perforation of Hard Palate.

By A. L. MACLEOD, M.B.

MALE, aged 69, who has worn a tooth-plate for years. For five years liquids and soft foods got into the right nostril. There is a perforation of the hard palate which the exhibitor suggests is due to pressure atrophy. There is no sign of a neoplasm.

Mr. E. WATSON-WILLIAMS said that he had had a similar case three years ago, the damage to the palate having been discovered accidentally. The patient had a foul discharge from the nose, and he was asked to remove his tooth-plate, which he had not done for two years. A perforation in the palate was then seen, exactly the size of the rubber cup of the suction plate, and the bone seemed to be completely gone. He could not demonstrate a passage between mouth and nose.

Tumour of Upper Jaw originating in Maxillary Sinus, and Non-malignant Stricture of Oesophagus.

By T. B. LAYTON, M.S.

MRS. C., first seen December 22, 1922, then aged 39, eight months pregnant; swelling of left inferior turbinal, bled easily, polypoid masses in middle meatus,

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piece removed for section: Report, "no evidence of malignancy." Sinus could not be washed out; opaque to transillumination. Returned in February: obstruction to lachrymal duct, mass rising from upper wall of maxillary sinus into orbit.

Operation by Musgrave Woodman's technique (*Journ. Laryng. and Otol.*, 1922, xxxvii, p. 287), intratracheal ether, sitting up in dental chair, all mucous membrane of sinuses removed (from frontal to sphenoidal). Portion of upper jaw removed leaving palate, malar taken away (Trotter's method, *Lancet*, 1913, i, p. 1149), periosteum of orbit cut into (to avoid growth) allowing orbital fat to herniate downwards.

One year later sustained traumatic ulceration of œsophagus from hydrochloric acid. Admitted under Dr. Fawcett. Treatment: Gastrostomy and masterly inactivity, œsophagoscopy when ulceration healed, top of stricture seen 4 in. below arytenoids, minute orifice, would not admit smallest bougie. No further treatment, Swallowing gradually improved; for last fifteen months she has not used gastrostomy. Tube removed November 22, 1926, to allow closure.

She states that she can eat anything, but she has to chew very well and to eat slowly.

Radiographic Reports by Dr. Lindsay Locke.

February 21, 1924.—Fluid opaque food temporarily arrested in upper part of œsophagus (constriction about level of cricoid), but passes through slowly and with considerable efforts of deglutition.

November 29, 1926.—Opaque food passes freely down the œsophagus, but there is a narrowing at the level of the upper margin of the clavicle.

Pathological Report by Dr. G. W. Nicholson.

The specimen originally removed is a squamous-celled growth of a "cauliflower" type. It consists of folds and papillæ of a loose, vascular, inflammatory connective tissue, without remains of mucous glands or other physiological structures. These papillæ are lined with a thick layer of non-keratinized squamous epithelium. In several places, where it is œdematous, its cells are separated from each other by fluid. The inter-cellular bridges of the prickly cells are lengthened and greatly accentuated in these places. Although the epithelial processes, which are generally broad, extend deeply into the stroma, they are sharply defined and show not the slightest signs of infiltration. Even when they are narrow their definition is perfect. They are now merely compressed by the growth of contiguous connective tissue papillæ or granulations. The mode of growth of the epithelium is everywhere confined within physiological limits, since it merely extends between and forms a covering for granulations.

The tumour of the antrum, the structure of which is identical, forms a lining for the sinus and is separated from its bony wall by thick periosteum. Here again there are no signs of infiltration of epithelium.

Pieces removed from other parts of the nose and the sphenoidal sinus show nothing beyond chronic inflammation and hypertrophy of the mucosa, with catarrhal changes of the mucous glands. In places where the surface epithelium is present it is of the physiological columnar-celled type, though more or less extensively inflamed.

The specimen is a squamous-celled papilloma with rapid but strictly local and expansive growth. It appears to have originated by continued irritation of one of the patches of squamous epithelium that are produced with great frequency in chronic inflammations of the nose.

Discussion.—Mr. MUSGRAVE WOODMAN said that some years ago he had studied the pathology of these lesions with the late Professor Shattock. Many of them were clinically classified as epitheliomata, but they showed columns of cells like a scirrhous carcinoma. Professor Shattock would have considered the present case to be one of epithelioma. Another group was that of endothelioma, in which were large vacuolated cells. He (Mr. Woodman) asked what precautions Mr. Layton had taken to support the eye after these operations. If one left the roof of the antrum or a little bridge of bone under the eye, that was sufficient support, and if that bone were taken away and the periosteum left, there

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was still some support; the eye fell a little afterwards, but gradually recovered its position. But if one had to remove the periosteum and the fat dropped through, the eye fell badly, and in several of his (the speaker's) own palate cases it had subsequently to be excised. There were two methods of overcoming that. One was the immediate formation of a sling beneath the eye by a strap taken up from the internal pterygoid muscle; the difficulty was in fixing it, as there was not a very good hold on the nasal side. The other method which he (the speaker) had tried was one suggested by Mr. O'Malley, namely, to pack the whole cavity with gauze steeped in bismuth and iodoform, and leave it in position for eight days. He (Mr. Woodman) had had a patient with double epithelioma of the upper jaw, and he had had to remove both upper jaws, including the palate. He had adopted the latter method of dealing with the eye, temporarily sewing back the soft tissue of the palate in place, and left it in situation eight days. When the packing was removed the patient's eye was in the normal position.

Mr. SOMERVILLE HASTINGS said that he had had many cases similar to this, and the pathologist at Middlesex Hospital called them endotheliomata. He (the speaker) regarded the specimen now under the microscope as a typical endothelioma. The report might be that there was no evidence of malignancy, but tumours of this kind tended to recur. Still, when they were thoroughly removed there was a certain proportion of excellent results. Two patients from whom the growth had been removed ten years ago and seven years ago respectively were still well. In one of these cases there had been recurrence, but, after a further removal of growth, the patient had become well and had remained so.

Dr. IRWIN MOORE asked what was meant in the notes by the words: "All mucous membrane of sinuses removed (from frontal to sphenoidal)," also whether this case could not have been dealt with by a Moure's operation, with much less destruction to the face. Was it an upper jaw tumour, or an antrum tumour?

Dr. JOBSON HORNE said that in view of the report as recorded in the notes of the case that there was "no evidence of malignancy" he thought the technique employed in the operative treatment had been unduly severe.

Mr. LAYTON (in reply) said he regretted that no one had discussed what he thought was the more important side of this case, namely, the wonderful recovery from the traumatic stricture of the œsophagus. This was his chief reason for showing this case. If ever he had a similar case he would have a gastrostomy performed at once to rest the œsophagus, and would pass no instrument of any sort until he felt sure that all ulceration had healed. Remembering vividly the minute orifice of the top of this stricture he would never despair of getting back good swallowing power if only the œsophagus were left alone.

With regard to the tumour of the upper jaw, he would ask Dr. Nicholson to write a full report on all the sections (now inserted above). He (the speaker) was not greatly concerned with the pathological report; *clinically* this tumour was malignant, and he thought the patient was well rid of it. In answer to Dr. Irwin Moore and to Dr. Jobson Horne, the tumour, while under observation, was growing rapidly, and any operation but this would have been insufficient; he had left the important part of the upper jaw—the hard palate; the rest had to be removed as the tumour had already penetrated through the wall of the bone into the orbit. Nothing had been done to support the eye. It would have been unwise to leave even the fascial sling beneath the eyeball. This case showed how small was the deformity even when the cut went into the orbital fat. In earlier days this woman would probably have had her eyeball excised with an exenteration of her orbit. As it was, the falling down was very slight and she had binocular vision.

Orbital Abscess and Ethmoiditis.

By T. B. LAYTON, M.S.

H. B., AGED 14. *September 17, 1926.*—Admitted with swelling of upper eyelid and pus in middle meatus, high resection of middle turbinal that evening under local anæsthesia.

September 18, 1926.—General anæsthetic, incision of skin, pus found between

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bone and orbital periosteum. No evidence of osteitis either of roof or inner wall of orbit. Lachrymal bone removed, mucous membrane of ethmoidal cells bulged into orbit. No pus in nose after fourteen days.

October 8, 1926.—High operation on septum under local anaesthesia to give more space in middle turbinal region, small perforation low down, now some soft swelling in mid-turbinal region. This can be pushed aside to view the middle meatus.

Shown as a case in which the infection left the nose through the lachrymo-ethmoidal suture. There was no disease of the frontal sinus.

Stereoscopic X-rays (by Mr. Worth) shown.

[Mr. Layton also showed a girl, aged 19, who had had diphtheria and septic scarlet fever. During the course of these orbital oedema arose, with pus in the middle meatus, and a definite rounded swelling was palpable arising from the inner wall of the orbit. The only reason why an external incision had not been made in this case was that the patient was too desperately ill even to explore it with a syringe. By the time she was well enough to have anything done the whole condition had cleared up. Mr. Layton said that he had also hoped to show a girl, aged 14, who had had swelling of the upper eyelid with pus in the middle meatus, in whom the high resection of the middle turbinal resulted in the whole condition getting well. He had not, however, been able to get in touch with her again.]

Acute Frontal Sinusitis associated with an Orbital Abscess.

By M. VLASTO, F.R.C.S.

IN 1925, a patient, an adult male, had a large number of polypi removed from both sides of the nose. The removal on the right side was evidently not complete. When seen, in consultation with Dr. Varian, of Watford, in April, 1926, the patient was critically ill with an acute right fronto-ethmoiditis associated with a right orbital abscess. An external operation was performed on the lines suggested by Mr. Howarth, and the patient made an uninterrupted recovery.

Discussion.—Mr. WRIGHT asked first whether, in Mr. Layton's experience, an orbital suppuration was practically always due to nasal infection. He (the speaker) thought it was. Secondly, why did these cases occur almost entirely in children? Thirdly, with what frequency was the ethmoid the cause of the trouble in comparison with the frontal sinus, and what place in the treatment was occupied by an internal operation through the nose?

Dr. LOGAN TURNER said these cases exemplified two clinical types of orbital complication and methods of procedure. If the surgeon could diagnose a purely oedematous condition in the orbit, he was justified in at first adopting an intranasal procedure. But if pus had already formed in the orbit, interference must be from outside. These cases illustrated these two routes of approach. Some held that orbital abscess could be cured by an intranasal operation. That might be possible if the disease had already made a large communication through the os planum, but one could not tell whether destruction of the bone had taken place. Mr. Layton had said that the infection, in the case of H. B., passed through the lachrymo-ethmoidal suture. He (the speaker) thought it more likely that the infection had spread either by the veins from the deep mucosal layer of the ethmoid or by osteoclastic destruction of the bony wall.

Mr. MUSGRAVE WOODMAN asked for advice upon a case now under his own care. Six weeks ago the patient had been sent to him, the complaint being that the right eye was "blown out." There was a slight increase of temperature, with much pain. He (the speaker) did not know whether the exophthalmos was caused by pus or by air. He employed ichthylol externally, and packed the nose with 20 per cent. cocaine. In three days the patient had recovered, and nothing abnormal was seen in the nose. The previous day,

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however, he had returned again, with the same complaint, but not so severe. A skiagram did not show anything abnormal in the sinuses. What treatment ought he to adopt?

In a recent epidemic at Repton School he had had two cases of retro-orbital suppuration, and in both cases the eye was "blown out." One boy had a temperature of 105° F., with rigors. In one case pus was discharged from the frontal sinus owing to a perforation far back in the eye, and in the other in the lateral plate of the ethmoid; it had burst through a hole $\frac{1}{4}$ in. in diameter. Operation was carried out externally and both recovered.

Mr. N. S. CARRUTHERS said that during the last three years he had seen eleven cases of orbital œdema of intranasal origin. In seven of the cases he had found pus in the sphenoidal sinus. In two of the cases the treatment had simply been drainage of the sphenoidal sinus; and in the other seven cases the middle turbinate bone was removed in addition. All the patients had recovered without external incision and, in his experience, sphenoidal suppuration was a more common cause of orbital œdema than either ethmoidal suppuration or frontal sinusitis. He asked if anything had been done in Mr. Layton's case to investigate the condition of the sphenoidal sinus.

Mr. C. A. S. RIDOUT said that in a case of his own there had been external strabismus, with a high temperature, and pus coming from the middle turbinal. He had broken down a few ethmoidal cells and evacuated a large abscess. The eye fell back, and the patient had normal vision within a few days. If the intranasal operation could be performed, and the patient kept under careful observation, that was the best thing to do.

Mr. L. GRAHAM BROWN said he had had two cases of acute frontal sinus suppuration, with orbital inflammation, and he had adopted conservative treatment, removing the anterior end of the middle turbinal, canalizing the fronto-nasal canal, and withdrawing pus. In each case the condition had cleared up entirely. He doubted whether it would have done so if there had been pus in the cellular tissue of the orbit; in that case an external operation would have been necessary.

Mr. J. A. GIBB said that a patient, aged 82, had been referred to him by his ophthalmic colleague suffering from retrobulbar neuritis, with fixation of the eyeball and proptosis; she could only move the eye a little outwards. He had removed the ethmoid by his usual method, taking away half the middle turbinate and working outwards and upwards until he engaged the soft tissues of the orbit. The condition had cleared up. These proptotic conditions were due to paresis of the muscle, and as soon as that was removed the eyeball regained its normal position. It had been his custom to operate for these conditions in the acute stage, but at a recent meeting of the Section this procedure had been deprecated. Since that meeting he had had a severe case in a boy, aged 11, resulting from a blow on the nose. The temperature on admission had been 102° F., and he had postponed operation until it had come down. At the end of a week the temperature was nearly normal, and as it was reported that the boy had had a fit, it was decided to operate. The external route was adopted, the frontal sinus was opened and the ethmoid removed, drainage being carried out through the nose. Some time afterwards, as there was evidence of mental hebetude and as there was papilloedema on the affected side, it was decided to explore the frontal lobe for pus. This was done through the outer angle of the frontal sinus and a large abscess was evacuated. Drainage was hampered by repeated pocketing. Eventually the lateral ventricle was entered, and drained for three days, first pus and then cerebro-spinal fluid coming away. The patient became comatose, but when the tube was removed he became conscious, relapsed and died. He now thought that he ought to have operated in the acute stage and not to have waited, and he did not intend to delay in any future case. Recently he had had a case of acute sinusitis, with œdema of the lids, in a child aged 2 years. He had done the internal operation, removing the ethmoid, until he reached soft tissue, and also removing abundant adenoids. The temperature decreased and three weeks afterwards the child had left the hospital completely cured. He was certain that in these acute cases operation should not be delayed.

Mr. W. T. GARDINER (referring to Mr. Layton's case) said that a better line of treatment would have been to give a general anæsthetic and remove the middle turbinal in the first instance. He thought that the orbital abscess had been caused by Mr. Layton's incomplete operation.

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Mr. LAYTON, in reply to Mr. Wright's four questions, said:—(1) He thought these orbital swellings were always due to disease of the sinuses. The term orbital cellulitis was wrong, since an actual inflammation of the orbital cellular tissue was very rare. The condition was an intra-orbital extraperiosteal oedema followed by exudation of pus with abscess formation. (2) He (the speaker) had himself been puzzled at the relative frequency with which these cases occurred in children. He suggested that one reason might be the great difficulty of diagnosing sinus suppuration at this age. It was almost impossible to get a child to submit to the manipulations of washing and mopping the nose until it was clean, yet by this method alone a sound diagnosis of sinus suppuration could be made. As a result we were liable to overlook the condition until the orbital complication had occurred. He did not know that he had ever accurately diagnosed suppuration in the cells in children until the disease had left the cells for the surrounding parts. He did not suggest that this difficulty was the only cause of the relative frequency of the orbital complications in children; there were anatomical differences between the child and adult, the exact significance of which had not yet been worked out. (3) One of his reasons for showing his case was to lay stress on the ethmoid as a cause of orbital complications. Personally he thought that the ethmoid was more frequently the cause than the frontal sinus. He found that the majority of the profession—students, practitioners, ophthalmologists, and general surgeons—jumped to the conclusion that there was frontal sinus disease as soon as they saw an orbital swelling. He presumed that they had learnt to assume this from rhinologists or their writings; but he thought the assumption was wrong. (4) In this question Mr. Wright had touched upon his (Mr. Layton's) other reason for showing his case. He wished to put forward the view that with these cases, as with those without orbital signs, intranasal treatment was the course to be followed, and that external operation, if any, should be minimal. He thought Dr. Logan Turner had summed it up correctly when he said that a case with oedema might get well without external incision, but that when an abscess had formed it would not do so. He (the speaker) wished, however, to urge that in a case where it was not known whether pus had formed or not, intranasal drainage should first be employed. If oedema only were present this treatment would be sufficient. If pus were present, the drainage would cause the oedema to subside, and the abscess could be incised under better conditions than across a swollen oedematous area.

Mr. Ridout had referred to an orbital abscess drained through the ethmoidal region with success; he (Mr. Layton) thought that such a case must be exceptional. Mr. Graham Brown's case supported his view; apparently the pus was in the frontal sinus and oedema only was in the orbit. In answer to Mr. Gibb, he did not say he would always refrain from the external operation when he first saw the case. It depended upon a clinical assessment of the severity of the case, upon having the patient in such a position that he could be watched from morning to night, and upon getting efficient intranasal drainage. He claimed that it was safe to wait for twenty-four to forty-eight hours in the majority of cases. When the abscess was opened he did not think it necessary to touch the bone unless the carious spot was seen through which the disease had spread. This brought him to Dr. Logan Turner's question about the route by which the inflammation had spread from sinus to orbit. He (the speaker) did not know that it had been spread through the suture, he believed that in many of these cases this was the route; it was a point upon which we needed observations. He had removed the lachrymal bone to procure drainage between orbit and nose, and suggested it as a conservative method where osteitis could not be recognized by the naked eye. He had not observed sphenoidal sinusitis with oedema of the orbit, he knew of specimens in which this sinus passed out into relation with the roof of the orbit, but he suggested that in Mr. Carruthers' cases there might have been pyosinus of the sphenoid and the orbital complications secondary to posterior ethmoidal cells. In either event the results supported his (Mr. Layton's) contention. In reply to Mr. Gardiner, the abscess was there on admission, and the greater part of the middle turbinal was still present in this child; that was where the art came in! In the high removal of the middle turbinal, the piece removed was very small, no larger than the end of a pencil, just large enough to be gripped by the end of a Luc's forceps; but it was the only bit that mattered, and the removal of any other bit not only was unnecessary, but was not effective. He was entirely opposed to the removal of the whole middle turbinal. He thought that this was an operation fraught with great potential risks. Dr. Logan Turner, in his lecture at the Central London Hospital two months ago, had "given them furiously to think" on this point, and he (the speaker) tried to avoid the main part of this process on every possible occasion.

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Mr. VLASTO (in reply) said he had been surprised by some of the opinions they had heard stated. In cases of definite acute fronto-ethmoiditis associated with orbital inflammation, he (Mr. Vlasto) could not entertain the idea of any other treatment than an external operation. Any other form of treatment he regarded as merely playing with a very dangerous condition. No doubt cases would be reported from time to time in which the inflammation had subsided as a result of removal of a portion of the middle turbinal, but in his opinion this was no justification for the method of treatment recommended. He could not agree with Mr. Layton that a differentiation between inflammatory œdema and pus formation was possible or even useful. In his (Mr. Vlasto's) own case, there had been nothing to show the extent of the pathological process, and yet the frontal sinus was full of pus and the floor was necrosed and perforated. Any other than an external operation would have been fraught with the most serious consequences. He (Mr. Vlasto) had had two other similar cases which had been treated by the method advocated by Mr. Howarth. Recovery had been complete, and the cosmetic result good.

Mr. LAYTON (in reply to Mr. Vlasto) said that the case shown by Mr. Vlasto was in no way analogous to those shown by himself. His cases were examples of acute disease; Mr. Vlasto's was a case of orbital complication of very chronic disease. He (the speaker) would never have advocated refraining from an external operation in such a case.

Fibroma on Anterior Surface of Left Vocal Cord.

By H. J. BANKS-DAVIS, M.B., F.R.C.P.

FEMALE, aged 60, complained of hoarseness and was in considerable distress with acute laryngitis. A fortnight later, when the laryngitis had disappeared, the voice became normal and remains so although the fibroma is still present.

Case of Tonsillitis: possibly Tuberculous.

By A. L. MACLEOD, M.B.

PATIENT, male, aged 40, was first seen on November 10, 1926, complaining of pain on swallowing, of three weeks' duration. A piece removed from the right anterior pillar of the fauces shows a typical tuberculous lesion full of epithelial cells and giant cells. A fair number of tubercle bacilli have been demonstrated in it. The patient now has definite laryngitis.

Wassermann reaction negative.

Ulceration of Epiglottis; for Diagnosis.

By L. GRAHAM BROWN, F.R.C.S.

PATIENT, female, aged 71.

Burning sensation in throat with somewhat painful deglutition at intermittent periods since July, 1926.

Tip of epiglottis shows a superficial ulceration. Wassermann reaction negative; chest examination for tubercle negative; organism of Vincent's angina not found; patient denies any history of trauma. Ulceration varies in extent at different intervals; at one time, in September, 1926, disappearing altogether.

Discussion.—Mr. H. TILLEY suggested that the condition might be pemphigus. In the spring of this year he had seen a similar case, though more extensive; there were blebs

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inside the cheek and on the tongue, on the floor of the mouth, and on the free portion of the epiglottis. Scrapings from the ulcers were taken, and streptococcal organisms were found. Vaccine was given, but without result; at intervals the condition largely cleared up leaving only one or two ulcers; the patient had then gone to a hospital on the South Coast, but the lesions had returned, and she had died later on from what appeared to be general exhaustion.

Mr. G. W. DAWSON said that the patients in these cases lived longer than was usually believed. He (the speaker) had shown a case in which the condition was very extensive, embracing tongue, cheeks and larynx; and the patient had lived for years, and might even be alive now. It was very unusual to see pemphigus limited to the epiglottis.

Dr. BROWN KELLY said that the lesions were compatible with those of pemphigus. It might be a long time, even some months, before blebs chanced to be seen in these cases. Stress had been laid on the bacteriological examination by some, but he did not think that it gave positive information. In the course of time the eyes might be affected and the patient become blind, but death might not occur until years afterwards; the patient in a case of his own had lived for ten years. Arsenic seemed to have the best effect on the disease.

Sir JAMES DUNDAS-GRANT said that the lesions in this case reminded him of the white aphthous spots he saw recently on the palate of an elderly man suffering from chronic tuberculosis. There was intense pain. There was also tuberculosis of the epiglottis. The spots had disappeared after being brushed with an emulsion of anæsthesin and menthol, and the pain had ceased on insufflation of anæsthesin and orthoform.

Dr. W. H. KELSON said he thought this condition might be herpes; it had quite disappeared once or twice, and the smarting pain had ceased simultaneously. The appearance was that of herpes vesicles which had broken, and this was in a position where it could easily occur and be irritated.

Mr. GRAHAM BROWN (in reply) said he had had the case under observation every fortnight since August, 1926, and his impression was that the lesion was herpetic, a diagnosis which he was interested to hear Dr. Kelson support. On the other hand, Sir StClair Thomson agreed with Mr. Tilley that the condition was one of pemphigus, though this was a very rare site for the disease, and had suggested a course of salvarsan treatment with appropriate diet, tonics and rest in hospital.

Tumour of Submaxillary Gland.**By W. H. JEWELL, M.D.**

PATIENT, girl, aged 12, gave a three years' history of swelling in the right submaxillary region. The swelling was soft, elastic and painless; during the last six months it had increased in size; the size varied slightly, but the variations had no relation to the taking of food. X-ray examination reveals no calculus.

Discussion.—Mr. LAWSON WHALE said he thought the tumour was a cystic hygroma.

Mr. G. WILKINSON said that if this was a branchial cyst it would be difficult to remove, and an exploratory puncture would clear up the doubt as to its nature.

Mr. JEWELL (in reply) said that he intended to remove the tumour. Should it prove to be a submaxillary gland tumour he would expect it to be one of those arrested developmental tumours found in the salivary glands; some support was given to this suggestion by the fact that the patient had a congenital cataract.

Double Recurrent Paralysis of the Vocal Cords.**By W. M. MOLLISON, M.Ch.**

PATIENT, female, aged 40. Left breast removed for carcinoma three years ago. After operation (June, 1923) patient remained well until January, 1926, when the following symptoms simultaneously developed: (1) Hoarseness, amounting to almost

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complete loss of voice; (2) Regurgitation of fluids on attempting to drink; (3) A sensation as of having "a bone in the throat" on attempting to eat.

In May, 1926, the patient had a miscarriage.

In August, 1926, vomiting became a feature of the condition. The patient vomited the whole of a meal about 10 or 15 minutes afterwards. At this time she became breathless on exertion—for example, after vomiting. For the past three months (from September to December, 1926) there has been no vomiting. Eating and drinking have been normal, but after a meal there has been continual regurgitation of mucus into the mouth. The patient has gained weight in hospital. There is still breathlessness and the voice is very hoarse.

For the last six weeks the pupil of the left eye has been smaller than that of the right.

Discussion.—Mr. TILLEY asked whether the right cord was now in the cadaveric position, and, if so, how long was the interval between the recognition of abductor and that of adductor palsy?

Dr. BROWN KELLY said this was not a complete recurrent paralysis; both cords were in the cadaveric position and could not be abducted, but both could be partially adducted posteriorly. The left sympathetic also appeared to be affected, as the pupil on that side was small.

Dr. JOBSON HORNE said he thought there was a definite movement of the right cord but none of the left.

Mr. MOLLISON (in reply to Mr. Tilley) said that the interval about which he had asked was about three or four weeks.

Case of Laryngitis: for Diagnosis.

By W. M. MOLLISON, M.Ch.

PATIENT, male, aged 66. For two years and a half his voice has been growing gradually weaker and now remains as merely a whisper. The Wassermann reaction is negative, but he has had a course of treatment by novarsenobillon. No tubercle bacilli in sputum.

Eight months ago the left vocal cord showed the white projections still seen, but during the past few weeks the anterior two-thirds of the left cord and the whole of the right cord have become red.

Discussion.—Mr. NORMAN PATTERSON said he regarded this as a case of keratosis of the larynx; it was much like a case he himself had seen many years ago.

Mr. H. TILLEY said he thought a direct laryngoscopy should be made with the view of removing some of the white material from the cord, though, as a rule, he, personally, disliked having to depend upon a diagnosis made from a microscopic section of a laryngeal growth, and particularly so if he was suspicious of its malignant nature from a clinical point of view.

Mr. J. F. O'MALLEY said that he too had had a very similar case three years ago, which he had regarded as early epithelioma. As the mouth was septic the teeth were all extracted. The patient had then passed from his observation, and had gone into hospital under the care of Mr. Cleminson, who had removed a portion of the lesion, and the report was that it was an innocent papillomatous condition. Still, he (the speaker) suspected that some day it would become malignant, and this was his opinion about this present case.

Mr. H. S. BARWELL said that there was a patch of keratinization. He thought the condition was a chronic pachydermatous laryngitis.

Section of Odontology.

President—Mr. J. B. PARFITT, L.R.C.P.Lond., M.R.C.S., L.D.S.Eng.

Non-Eruption of Teeth.

H. P. PICKERILL, C.B.E., M.D., M.S. (New Zealand).

LAST September Miss T., aged 51, was referred to me for persistent neuralgia of a vague and periodic character generalized in distribution in both upper and lower jaws. She gave a history of non-eruption of teeth—that she was aged 21 before she cut any second teeth and then only one or two; that Mr. Maggs, at Guy's Hospital some years ago, had removed eight teeth for her, and I find that the case was reported by Mr. Maggs to this Section. The sequel will therefore be interesting to him and to others. She ascribed her neuralgia to teething and said that all babies had her utmost sympathy.

On examination, the patient was apparently edentulous except for an upper molar on each side. One could just discern the enamel tips of three other upper teeth and two lower—level with the gums. There was not much tenderness on pressure, the tissues were fairly normal and she was wearing very nice upper and lower dentures made for her at Guy's Hospital; these were quite functional and had not been displaced at all by erupting teeth.



FIG. 1.

Skiagrams of the mouth revealed the fact that there were no less than twelve teeth unerupted (fig. 1). They were, as far as could be ascertained: four upper premolars, two upper canines and three abnormal upper incisors: two lower canines, one lower incisor and two lower wisdom teeth.

Under general anæsthesia I removed all the teeth (fig. 2), erupted and unerupted, except the lower wisdoms (fig. 2). These I would have removed only I had failed to have them accurately localized, and found the bone over them exceedingly dense. I therefore desisted in order that they should be localized, as the total depth of bone in this region was not very much and I wished to avoid unnecessary chiselling. The

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patient, however, afterwards decided against removal of the wisdom teeth, stating that she had never had any pain in these regions. The unerupted teeth were found not to have any true sockets but to be imbedded in and firmly attached to a mass of dense fibroid tissue through which it was difficult or impossible to make the blades of the forceps travel without the aid of the knife. In fact the upper incisor teeth I removed through an alveolectomy incision and flap. All incisions and wounds were sutured and the mouth healed excellently in a week. All pain and neuralgia disappeared; she was fitted with new dentures and departed quite happy.

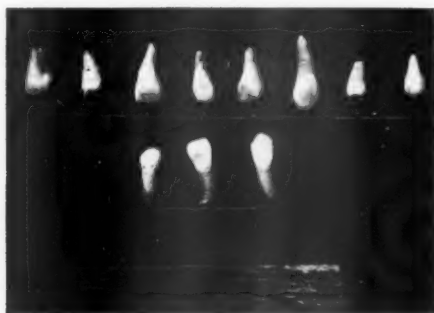


FIG. 2.

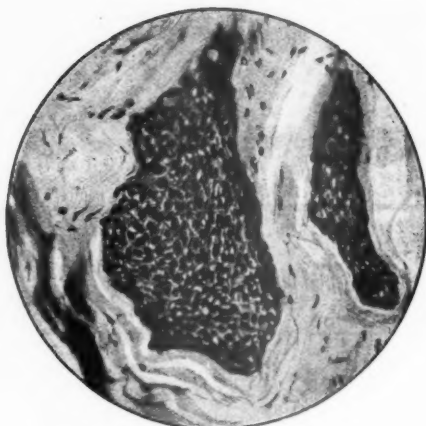


FIG. 3.

Now comes the most interesting part of the case. One of the teeth I removed with its fibrous attachments entire and the latter was seen to fit like a "caul" over the crown of the tooth. I immediately began to wonder where Nasmyth's membrane was—on the tooth, or attached to the "caul"? I tested four of the teeth for the membrane and found not a vestige. I then had sections cut of such of the fibroid tissue as I had removed (I now wish I had removed much more), and found in

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places islands of epithelium in dense fibrous tissue and in places strands of epithelium as if it had been lining a cavity or lying against a tooth (see fig. 3). I have no doubt that this epithelium represents the external epithelium of the enamel organ. What, then, is the pathology of the whole condition?

I think it might be classified under the odontomata. A fibrous odontoma is a hyperdevelopment of the tooth sac at the expense of all other tooth elements and therefore necessarily begins developing very early, since there are usually only small denticles or mere vestiges of calcified dental tissues, or indeed these may be entirely absent. In the present case, however, is it not possible that the growth stimulus (whatever it may be) to the tooth sacs may have arrived much later—after the teeth had been much more formed though still small and stunted? It is significant that the two upper molar teeth were of normal size and had erupted normally. Of course the whole event may have been the manifestation of rickets from which she suffered as a child.

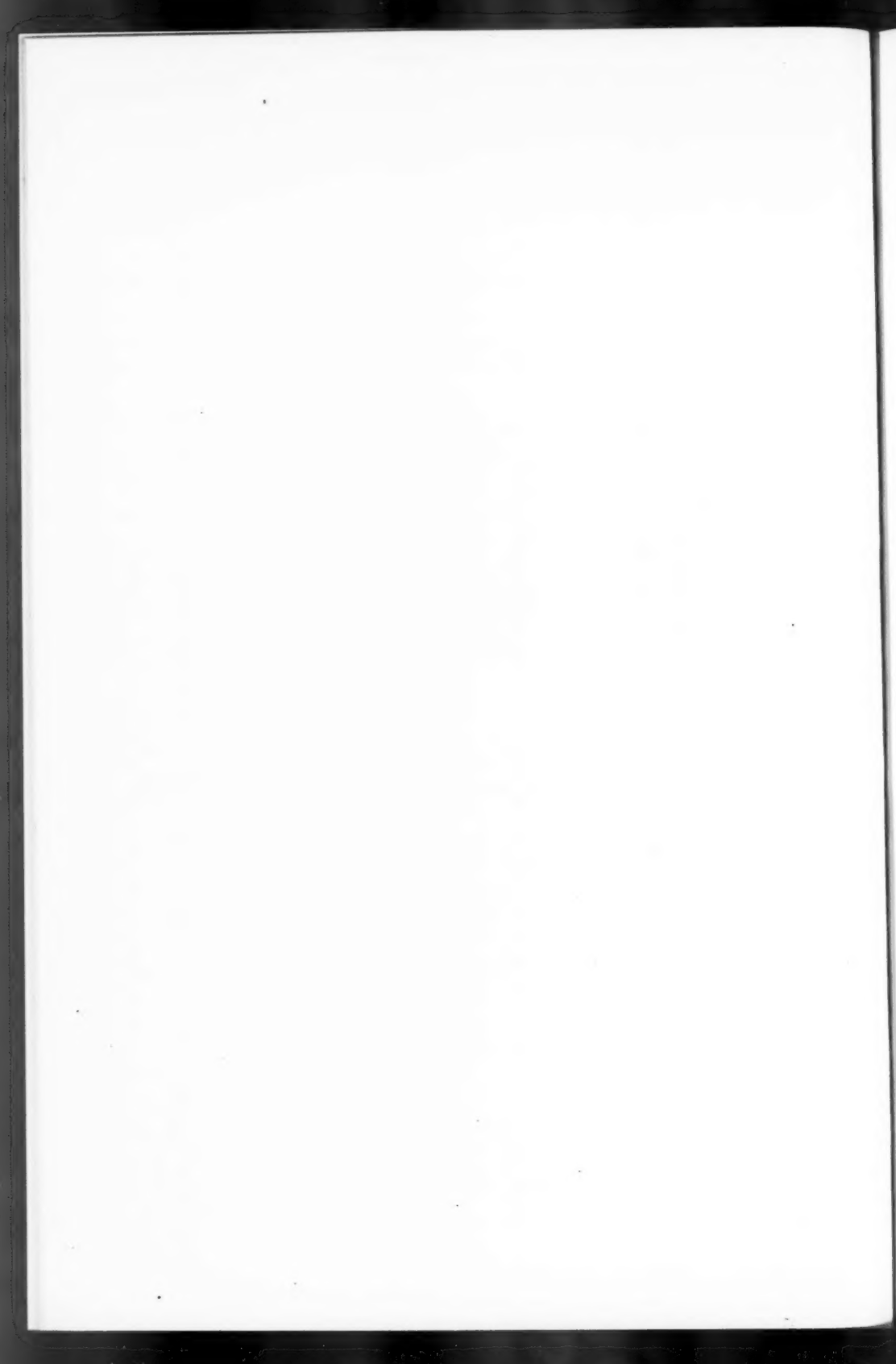
There is also the interesting speculation as to whether any epithelial neoplasm will result from the opening up and stirring up of the buried epithelium, which, however, it would have been impossible to remove, even had I known it was there.

Discussion.—Mr. H. L. MESSENGER said that the case was Mr. Maggs's, but that he (Mr. Messenger) had reported it to the Section in 1920.¹

Mr. J. LEWIN PAYNE said: The delayed eruption of teeth, of course, is not an uncommon condition; but it is unusual for a patient to reach the age of 21 before erupting any permanent teeth, and then, after a further delay of thirty years, for other teeth to show signs of coming into place. The wearing of dentures may, as often happens, have stimulated this movement during the last few years. There seems to be some discrepancy concerning the number of teeth involved, for Professor Pickerill speaks of twelve unerupted teeth and then proceeds to enumerate fourteen. Another feature of interest is the persistent neuralgia. I think it is quite evident that unerupted teeth not infrequently give rise to some nervous symptoms. Quite recently I saw a patient in whom an unerupted upper canine was associated with noises in the head. There is also the suggestion by Professor Pickerill that the dense fibrous tissue, forming a sort of cowl over an unerupted tooth, indicates the presence of a fibrous odontome. One would like to see a little more of the histological nature of the tissues surrounding the tooth before offering a definite opinion. It must be remembered that fibrous odontomes are rare, and especially rare amongst human beings. Then, it does not appear that there was any enlargement of the jaws which would have been expected if a fibrous odontome had been present.

It is stated that the patient suffered from rickets in early childhood. We know that delayed eruption of teeth is common amongst patients suffering from rickets. We also know that there is frequently an increased formation of dense fibrous tissue covering the bone in rickety subjects. And, although rickets and fibrous odontomes have been closely associated, it seems more probable that the fibrous cowl referred to was a result of rickets alone.

¹ *Proceedings*, 1920-21, xiv (Sect. Odont.), p. 26.



Section of Ophthalmology.

President—ERNEST CLARKE, C.V.O., F.R.C.S.

Retinal Petechiasis a Clinical Entity of Auto-Intoxication.

By H. MORELAND MCCREA, O.B.E., M.D.

IT is not my intention to initiate an academic discussion on the word "hæmorrhage," but rather to point out in what way the condition of which I wish to speak to you differs from true hæmorrhage, and to show that treatment on the proper lines can be followed by success.

(1) RETINAL HÆMORRHAGE.

The word "hæmorrhage" means to me that a vessel has ruptured, and that its blood content has escaped into the surrounding tissues, and my contention is that this is the only state to which the term "hæmorrhage" should be rightly applied. Hæmorrhage in the retina is seen in people getting on in years, whose blood-vessels show marked degenerative changes, and whose blood-pressures are almost invariably high, particularly in the diastolic readings. You will agree that little or nothing can be done for hæmorrhagic changes in the retina, when due to blood-vessel degeneration.

(2) RETINAL THROMBOSIS.

Thrombosis of retinal vessels is another state found in vascular degeneration. Here again there is such destruction of retinal tissue by hæmorrhagic extravasation that little can be done to improve the sight of those affected.

(3) RETINAL PETECHIASIS.

There is, however, a third type which at first sight has all the appearance of, but is not, a retinal hæmorrhage, and it is the type which I wish to isolate as a separate clinical entity from the two previous classes. To this type I have given the name of "retinal petechiasis." It is not a true retinal hæmorrhage as I understand the word. It differs from hæmorrhage:—

- (1) In being an exudation of blood without rupture of the blood-vessel.
- (2) In its pathology.
- (3) In its clinical history and appearance.
- (4) In its treatment.
- (5) In the fact that recovery may follow its correct treatment.

(1) Terminology.

In calling this condition an exudation, I am not making an extravagant or incorrect statement. Physicians do not talk of hæmorrhage from the lungs when describing the rusty sputum of lobar pneumonia. The presence of the blood is due to an exudation and not to a true hæmorrhage. We do not regard blood in the urine of an acute nephritis as a hæmorrhage. Many of you must have seen, while walking the bank of a stream, small areas covered with fresh well-grown grass close up to the bank, and only found these areas were sodden with water after sinking into them over your boot-

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tops. The river has not burst its banks, the water has only oozed through the banks without rupturing them. I believe it is in much the same way that retinal petechiasis is produced, and my contention is that this state is an exudation and not a true hæmorrhage.

(2) Pathology.

It is difficult to speak accurately of the pathology of this condition. As far as I am aware, no pathological examination has ever been made on an eye damaged in this way. It is therefore necessary to deduce the pathology from the ophthalmoscopic findings. In typical examples the appearances may be likened to blood splashes, hence the title which I have chosen—retinal petechiasis—to describe the condition.

In severe examples the lesion appears as if one had taken a handful of blood-stained mud and thrown it at the retina in the region surrounding the disc. In severe types these splashes may be confluent, and so resemble a true hæmorrhage, and the vitreous may be cloudy. In milder cases small discrete splashes of blood-coloured exudations may be seen scattered over the same region. In severe and mild cases these splashes have no relationship to ruptured blood-vessels, in fact, intact blood-vessels may be seen at times to traverse the exudation. There is therefore a very distinct difference from the appearance of a true hæmorrhage, where a degenerated vessel may be seen to terminate abruptly on the edge of a large hæmorrhagic area.

One of the functions of the capillary wall is to confine within it the blood-content. If this function be disturbed in certain ways, it is then possible for the content to escape just as the water oozes through the bank of the stream, and it is in this way that these splashes are produced.

Krogh, of Copenhagen, has shown that the capillary walls can be subjected to stimulation, and that the response may be in the nature of contraction or relaxation, and also that with the increasing relaxation they may become increasingly permeable to the constituents of the blood-plasma, until, when fully dilated, they fail altogether to retain them. I believe, and I understand others agree, that toxins circulating in the blood constitute the stimulus necessary to produce this relaxation, and in this manner these splashes are produced. If I am correct, it should be possible in all these cases of retinal petechiasis, first, to discover sources of infection; secondly, to prove that the removal of these sources should arrest the retinal process, and possibly alleviate or cure it; and, thirdly, one would expect that recurrence of the septic trouble by a lighting-up of a dormant source of infection would give rise to fresh and similar manifestations in the retina. These three conditions I can supply.

The first two are amply proved by the cases quoted later; as regards the third condition, which is perhaps the most important to prove my contention, it is amply borne out in the two following cases, the only ones that enable me to supply the necessary evidence.

In Case No. 4, the retinal trouble had settled down for a period of about six months, but recurred in a mild degree. New splashes appeared in the left eye about due north. The teeth had all been removed, and the tonsils examined by experts on several occasions and passed as inactive. On recurrence of the signs in the left retina the patient was again thoroughly overhauled. His general condition was good; there were no evident vascular changes. The blood-pressure remained about the same as formerly, namely 133—82. The urine contained no abnormality; there was no polyuria. However, on retracting the anterior pillar of the fauces on the left side, pus gushed out from the tonsil, and further examination located a small abscess at the top of the tonsil, a state of affairs of which the patient was totally ignorant.

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Again, in Case No. 11, vision after improving for five months began to deteriorate; fresh splashes were found on the retina close to the macula. In this case it was easy to find the trouble, as there had been a further septic invasion of the ethmoidal cells.

So far, I have not seen the characteristic petechial signs in the retina, and failed to find evidence of gross sepsis elsewhere. Here one purposely uses the word "gross," so that there may be no misunderstanding, as the term "sepsis" is so often used in a careless and indefinite manner.

As to the site of these splashes, my experience does not allow me to state that they occur in any particular part of the retina. Some allege that hæmorrhages, at any rate, are more apt to occur in the region of the macula, but I have not found it so as regards petechiasis.

By means of the electric ophthalmoscope, it is now easy to examine the fundus, and it is no longer the arduous, I might almost say the gymnastic task, it used to be. Is it not possible that if retinal examination were a part of the routine examination of a patient, these splashes would be discovered earlier and found in other regions outside the macula? The macula is the only portion of the retina likely to give rise to subjective symptoms; hence, when it is involved, the patient becomes conscious of a deterioration of vision and it is only then that he seeks advice and help, though the splashes may have existed elsewhere without his knowledge.

As regards the bacteriology, it was impossible to make the necessary examination in every case, but where it was possible the result will be seen in the report of the cases which follows. The organism mainly responsible, as far as my cases are concerned, was a streptococcus, but the cases in which the *Bacillus coli* were found should be noted.

(3) Clinical History.

There is a striking difference between the clinical history of petechiasis and hæmorrhage. My experience shows that in petechiasis the high blood-pressure which accompanies the hæmorrhagic conditions need not necessarily be present, as will be shown in the cases described later. Again, it may occur at any time from middle age onwards. The youngest patient in my series is Case No. 14, whose age was 40. The age of the patient should be no deterrent to investigation and treatment. Two of my cases amply illustrate this important point. The age of the one was 80, Case No. 11, and the age of the other was 83, Case No. 9. The former patient, after treatment, was able to read the type of an ordinary novel, and the latter, $\frac{1}{2}$ part, and Snellen 4. Both these patients when they consulted me had very poor vision.

Again, in the hæmorrhagic type, signs of degenerated vessels may be found elsewhere, but in petechiasis there may be no evidence of degenerative change whatever.

(4) Treatment.

The treatment is a final argument in favour of regarding this condition as a separate clinical entity; in true hæmorrhagic conditions there is little or no available treatment, while in petechiasis there is a definite line of treatment which is attended by excellent results, as will be shown later in the description of cases. The first essential thing is to seek the source of infection, and then, where possible, remove it. If removal be impossible, vaccines can be tried, although I have not much faith in them unless the source of the infection can be removed. The vaccines should be autogenous. They should be prepared from the particular micro-organism which is considered to be responsible, and if possible the culture should be made direct from the principal source of infection.

Concerning the site of these focal infections, the teeth, the tonsils, the accessory sinuses, the ethmoid, and the urinary tract in my cases are respectively or collectively responsible for the condition.

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Teeth.—There was much more serious infection in my cases than pyorrhœa (a condition perhaps too often diagnosed as a cause of disease). There was definite alveolar involvement at the roots of the teeth, as shown by X-rays, and this was effectively treated.

Here may I be permitted to mention a lesion in the mouth, which too often passes unrecognized, namely, a pocket (at times a deep one) in the alveolus of the lower jaw behind the wisdom teeth. It is frequently the site from which there is a serious septic absorption, and is very often the cause of an extremely offensive breath. I am much indebted to Mr. Pallant for pointing out this fact to me.

Tonsils.—With regard to the infected tonsils associated with retinal petechia, in my experience it is not the large bulging organs that are to be feared, but rather the septic tonsils which are partially or completely buried. Case No. 5 well illustrates this point. The tonsils were quite invisible unless one retracted the pillars of the fauces, and when this was done a fair amount of free pus was discovered. Further, I have not accepted a tonsil as septic unless one could squeeze from it a thin, yellow fluid which, microscopically, proved to be pus. I am indebted to Mr. Jenkins for this suggestion.

Accessory Sinuses.—Old-standing diseased antra were the cause of loss of vision in Cases Nos. 7 and 8. Case No. 8 also illustrates a pitfall in examination. Trans-illumination showed only some loss of light on this side, and X-rays helped very little; it was not till the cavity was washed out that the diagnosis was made a certainty.

With such an awful future as blindness to look forward to, I have frequently advised, disagreeable as it is, that the patient submit to the discomfort of the antra being washed out, even if the chances are against anything being found, and I do beg of the members of this branch of surgery to insist on this procedure in cases of retinal petechiasis when the source of infection is difficult to discover. I shall be forgiven, perhaps, for emphasizing this point, when you learn that in one case (not my own) after grossly septic tonsils had been removed, the patient only made slight progress. She was then re-examined, and a doubtful right antrum found; this was washed out, and a further operation advised. At the operation polypi were found in the antrum, showing that it was an old-standing trouble. It was not till this was done that the retinal condition showed any real improvement.

Ethmoid.—A septic ethmoid can be held responsible in one case, No. 11. It is interesting from the fact that vision improved enormously for a time, and began to fail again owing to a recurrence of the trouble in the ethmoid.

Urinary Infections.—I am a little diffident in quoting urinary infection as a cause of the retinal condition, as so often the presence of organisms in the urine is merely due to the fact that they have filtered through the kidneys with the urine. Yet in three of my cases nothing else could be found.

Case No. 13 was seen five years ago, and the patient has been well for a number of years. It is impossible at the present time to detect any abnormality in the retina.

Case No. 12.—Streptococci in the urine are still being passed, and she has lately shown fresh splashes in the retina.

In most of the cases quoted there has been more than one source of infection, so the finding of one septic focus should not interfere with complete examination, which may bring to light a second focus. In Case 9 the patient suffered from atrophic rhinitis, and all the accessory sinuses of the nose were involved.

There is no doubt that retinal petechiasis can exist at the same time with true hæmorrhage and thrombosis, and there is no reason to assume that a blood-vessel which is so degenerated as to rupture should not be capable also of allowing exudation of blood. Nor is there any reason why gross sepsis should not play its part in affecting

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also previously degenerated vessels. In fact, I should be surprised if one did not find it so.

One case, No. 14, which I have under my care, is a good illustration of the double condition. There was a very serious lesion of the right eye due to thrombosis of the central vein. She had grossly septic teeth and these were dealt with. While under treatment a small splash or petechia was found close to the disc and south of it in the left or good eye, just after the last tooth had been extracted. The retinal lesion, however, completely disappeared in the course of a week, and now there is no evidence of it whatever.

Cases.

Below follow brief records of the fifteen cases to which reference has been made; they were sent me for medical examination by Mr. Ernest Clarke, Lieutenant-Colonel Elliot and Mr. Levy. The notes have been inserted to report the conditions of the retina and the acuity of vision. The ages ranged from 40 to 83; the blood-pressures were low rather than high. One case only showed albumin in any amount in the urine; none showed polyuria. As regards results, marked improvement followed treatment in 10 cases; moderate improvement in 2; no improvement with relapse in 2; one case was not seen again. The cases which showed no improvement were both due to a streptococcal infection, which so far all forms of treatment have failed to eradicate.

Case No. 1.—1896. Age 49. February 28, 1927. Vision $\frac{1}{2}$ partly and Snellen No. 1 easily.

September 9, 1926. Loss of sight right eye, a month previously. Blood-pressure 148—86. No albumin or polyuria. Three very septic teeth with abscesses. Tonsils septic. Right eye, large splash near macula; vision $\frac{5}{6}$, cloudy vitreous. Septic teeth dealt with at once, followed by slight improvement of vision.

October 18, 1926. Fresh splashes. Advised removal of tonsils.

December 10, 1926. Tonsils enucleated.

January 1, 1927. Vision $\frac{1}{2}$. Snellen 4, vitreous clear, splashes almost disappeared.

Case No. 2.—1457. Aged 70.

November 10, 1924. History in May, 1924, loss of sight right eye. Examination then showed small punctate hæmorrhages, generally distributed in the retina, involving the macula region, and passing into the disc. Left eye normal.

November 10, 1925. Right eye, cloudy vitreous; vision $\frac{5}{6}$. Blood-pressure 112—76. Teeth, only lower incisors remaining and very septic. Urine, *Bacillus coli*. No albumin or polyuria. Teeth extracted. Bladder washed out with oxycyanide of mercury; hexamine and autogenous vaccine, *Bacillus coli*, given.

November 27, 1925. Retinal blood-vessels visible. Vision Y at a yard, much scarring of retina. Small splashes left eye.

December 5, 1925. Urine sterile.

January 5, 1927. No evidence of retinal changes in left eye, vision $\frac{1}{2}$ with glasses; scars right eye, vision with glasses $\frac{3}{8}$ partly.

Case No. 3.—1485. Aged 63.

December 30, 1924. Thrombosis of left central vein with hæmorrhages. Right eye $\frac{1}{2}$; left eye $\frac{5}{6}$, not improved with glasses. Very septic teeth, upper right molars septic, stumps of upper left molars. Urine, albumin. Blood-pressure 210—118. Teeth dealt with.

December 29, 1926. Left eye, hæmorrhages completely cleared up. Small atrophic patch at macula. Right eye with glasses $\frac{1}{2}$. Left eye $\frac{5}{6}$.

Case No. 4.—71 and 1586. Aged 58.

July 2, 1915, when first seen. Oculist reported then: "A silver-grey patch of exudation in the macula region of right retina, the appearance not that of albuminuric retinitis." Wassermann negative. Blood-pressure 138—92. No albumin or polyuria. Treated with iodides.

October 8, 1924. Vision in left eye noticed by patient to be failing. Small hæmorrhages

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distributed over the retina, at that time also complained of pain in the left hip. X-ray photograph of hip showed no abnormality. Teeth examined and reported sound, also tonsils. Blood-pressure 132—86. No albumin or polyuria.

April 21, 1925. Teeth re-examined as eye condition was much worse, one loose tooth extracted which showed the horn-like transparency of an infected tooth. Streptococci grown from the canal of the tooth. On these findings, all the teeth were removed and found infected. Eye condition improved as regards splashes, but vision remained the same.

November 14, 1926. Fresh splashes due north. Antra washed out, nothing found. Left tonsil now found to be very septic. Under treatment at present time.

The point to note about this case is that the patient improved after the teeth were dealt with, and the fresh splashes appeared synchronously with the finding that the left tonsil was very septic. These tonsils had been examined before by specialists and passed as innocent.

Case No. 5.—812. Aged 58.

First seen in 1921. Then sudden interference in vision in right eye. No albumin or polyuria. Blood-pressure 180—80. Haemorrhage in right macula region, with cloudy vitreous. Left eye $\frac{1}{2}$ with glasses, right eye $\frac{3}{8}$.

December 16, 1926. Again seen on account of dimness of vision, left eye. Left eye, splashes in macular region, difficult to examine owing to cloudy vitreous. Right eye practically useless. Since first consultation, gall-bladder drained in October 1922. Present condition: blood-pressure 125—82. No albumin or polyuria. Naso-pharynx very septic. Left antrum and left frontal sinus dark. Left tonsil, quantities of pus on pressure.

December 17, 1926. Sinuses examined and washed out under anæsthetic. No pus found. Tonsils enucleated, left very septic.

January 5, 1927. Vitreous less cloudy. Vision improved. Right eye, no central vision. Left eye $\frac{1}{8}$ with glasses. Haemorrhagic splashes and changes at macula.

January 14, 1927. No haemorrhages to be seen. Vision with glasses: left eye $\frac{1}{2}$; right eye can get about.

This case is noteworthy from the fact that it was examined in 1921, owing to condition in right eye, and then septic tonsils were not found by me, as at that time I did not know that the only way to make sure that the tonsil was not septic was to retract the pillars behind which the tonsils were embedded. I feel certain that had this been done, the tonsils would have been found septic, the right eye possibly saved, and the left eye would have remained unaffected.

Case No. 6.—4581. Aged 64.

June 4, 1926. Blood-pressure 122—82. Retinal choroiditis reported in both eyes. Tonsils very septic. Free discharge of pus left tonsil, organisms mainly streptococci. Urine, no albumin or polyuria. Autogenous vaccine made and given till tonsils were enucleated in two months' time.

January 11, 1927. Patient's general condition good. No scarring of retinae. Small, punctate white spots here and there on retinae. Right eye $\frac{1}{2}$. Left eye $\frac{1}{2}$.

Case No. 7.—1487. Aged 65.

Sinus January 19, 1925. Lost sight in right eye ten years ago. Trouble in left eye began a year previously. Right eye, large haemorrhage with scars. Left eye, small splashes. Blood-pressure 172—102. Urine, a trace of albumin. No polyuria. Old diseased right antrum: organisms streptococci. Radical operation. Last seen March 25, 1925, when left eye had improved one line.

Case No. 8.—1950. Aged 66.

October 15, 1926. Vision failing for one year. Has not been able to read for a year. Teeth all false. Tonsils very septic. Right antrum dark. Right eye, scars. Left eye, cloudy vitreous and splashes. Blood-pressure 120—88. No albumin or polyuria.

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October 19, 1926. Antrum drained. Tonsils enucleated. Vaccine from antrum pus, organisms streptococci and Friedländer's bacilli.

November 22, 1926. Condition good. Snellen No. 4.

January 10, 1927. Vision now easily $\frac{1}{8}$ both eyes. Left vitreous a little cloudy. Very few small splashes seen, very little scarring.

Case No. 9.—1955. Aged 83.

October 1, 1926. Central retinal changes. Splashes in macula region. Vitreous cloudy. All teeth had been extracted two years previously on oculist's advice, with no improvement of vision. Blood-pressure 143—88. No albumin or polyuria. Atrophic rhinitis, involving sinuses as well as nasal cavity. Treatment local and autogenous vaccine from nose. Organisms, streptococci and Friedländer's bacilli.

October 20, 1926. Can read part Snellen No. 14.

January 11, 1927. General condition much improved and nasal sepsis much diminished. Snellen No. 4 partially.

Case No. 10.—1814.

June 25, 1924. Hæmorrhagic exudate in region of macula. Blood-pressure 172—126. Pure growth at end of forty-eight hours, streptococci in catheter specimen of urine. No albumin or polyuria. Not seen again.

Case No. 11.—780. Aged 80.

January 7, 1926. History of two years' failing vision. Blood-pressure 169—98. Emphysema, sibilant rhonchi all over lungs. Polypi both sides of nose. No albumin or polyuria. Vision: Right eye $\frac{5}{60}$; left eye $\frac{5}{60}$. Advised operation impossible owing to chest, age, etc. Patient insisted on operation. Ethmoidal cells opened up; polypi removed. Stood operation well. Recovery uneventful. At the end of two months could read an ordinary novel with right eye.

November 28, 1926. Eyesight failing again, since severe cold last month. Fresh splashes right eye. Ethmoid again shows evidence of infection.

Case No. 12.—1,107. Aged 60.

September 23, 1923. Severe operation for acute gangrenous appendix two years previously. Teeth all removed. Tonsils slightly septic. Blood-pressure, 220—110. No albumin or polyuria. Eyes: Left eye destroyed by operation for cataract (in Scotland, some years previously). Right vision $\frac{1}{2}$. Splashes all round disc, with some old scarring. Catheter specimen of urine, heavy growth of streptococci with mild *Bacillus coli* infection as well. Streptococci of same type found in the fæces. Treatment: Autogenous vaccine and hexamine.

November 18, 1923. Scanty growth of streptococci found. No *Bacillus coli*.

February 22, 1924. Catheter specimen sterile.

May 9, 1924. Oculist reports no hæmorrhage found after dilating the pupil.

February, 1926. Right vision $\frac{1}{2}$ with glasses. Right lens becoming opaque.

November 20, 1926. Three small hæmorrhages reported by oculist. Right vision $\frac{3}{8}$.

December 1, 1926. Urine shows heavy growth of streptococci.

January 6, 1927. Small splash to south-west on vessel wall.

January 13, 1927. Streptococci still present in the urine.

Case No. 13.—288. Aged 52.

June 10, 1920. History of headaches, giddiness, attacks of blindness in previous two years. History of purulent nasal discharge. Blood-pressure 122—82. Wassermann negative. Blood-count a little below normal. Urine, a few pus cells and *Bacillus coli*. No albumin or polyuria. Culture from antrum lavage showed an infection of one of the *Bacillus coli* group. Hæmorrhages both eyes, scattered all over fundus, but not at macula. Right vision with glasses $\frac{5}{8}$; left vision with glasses $\frac{5}{8}$. Treatment: Vaccine and hexamine.

December 24, 1920. Urine sterile. January, 1921. No hæmorrhages in either eye. Vision in both $\frac{5}{8}$. Fundi normal.

January 5, 1927. Patient reported in good health with normal vision.

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Case No. 14.—1933. Aged 41.

September 30, 1926. Eyesight failing for a fortnight; now cannot read. Right eye, thrombosis of central vein with hæmorrhages all over retina. Left eye normal. Very offensive breath. Blood-pressure 232—138. No albumin or polyuria. Teeth condemned and extracted. Autogenous vaccine from teeth made and given.

October 20, 1926. Splash in left eye due south.

January 5, 1927. Hæmorrhages in retina right eye. Blood-pressure 210—140. No abnormality retina left eye.

Case No. 15.—2024. Aged 65.

January 20, 1927.—Two months previously noticed loss of acuity of vision. Blood-pressure 172—102; no albumin or polyuria. Vision right eye $\frac{6}{60}$; left eye $\frac{6}{36}$ partly. Right eye: scars retina. Left eye: hæmorrhagic exudate, cloudy vitreous. Both tonsils very septic; both remaining teeth very septic.

January 23, 1927.—Tonsils enucleated; teeth extracted.

February 4, 1927.—Blood-pressure 458—78. Left eye: retina clear. Right eye $\frac{6}{60}$; left eye $\frac{6}{36}$, partly, Snellen No. 4 easily.

Discussion.—Dr. GEORGE A. SUTHERLAND said he was not aware of having seen the condition which Dr. McCrea had just described, and he was interested to hear that high blood-pressure was not the cause of it; indeed it was a relief to find, from the medical point of view, that there was a disease of this kind which was not ascribed to a heightened blood-pressure. Dr. McCrea found that the so-called "blood splashes" might be associated with degenerated vessels, but on the other hand the vessels might be quite sound. Yet though there might not be disease of the larger blood-vessels, there might be capillary oozing. The distinction made in the paper between real hæmorrhage and petechiasis was a novel one, and required thinking over. If, as Dr. McCrea said, this condition was a clinical entity, it was presumably also a pathological entity. Dr. McCrea grouped all his cases under the heading of sepsis, and with such a grouping he (the speaker) would like a more precise differentiation as to the specific cause. Two organisms were mentioned as associated with the cases, a streptococcus and the *Bacillus coli*, but this was not very definite.

A further point was that if this condition was associated with a hæmorrhagic condition or petechiasis, apparently the lesion was limited to the retina. There was nothing strange in that, because many hæmorrhagic diseases had a distinctly focal distribution; for example, in scurvy there were special areas of the body affected, and in some diseases petechiæ were found only in certain areas of the body. He asked whether in this condition of petechiasis hæmorrhage took place elsewhere in the body.

The condition now described was certainly very important from the medical point of view. It remained to be tested by other people, but he could not fail to be impressed by what Dr. McCrea had brought forward. The great test in these cases was the therapeutic test, and the author had certainly applied that very successfully. This condition claimed the serious attention of physicians and ophthalmic surgeons.

Mr. MONTAGUE L. HINE referred to the paper read at the Nottingham meeting of the British Medical Association last July by Mr. Foster Moore¹ on retinal hæmorrhages and their classification.

Mr. HUMPHREY NEAME said that in Mr. Foster Moore's paper, to which Mr. Hine had referred, there was mention of some recent experiments on the mechanism of oozing from capillaries, and the explanation given appeared to him to be rather fascinating. It was said that the capillaries were simply tubes of endothelial cells, a single layer of them, and that outside them were branching cells, with spaces between them; these branching cells were connected loosely, as a sort of meshwork, and were those which controlled the capillary calibre, enabling the capillaries either to dilate or to contract. The explanation given was that toxins probably affected the outer cells so that they lost their tone; hence they

¹ *Brit. Med. Journ.*, 1926, ii, p. 1097.

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allowed expansion of the capillary wall to excess, and thus leakage of blood between the endothelial cells.

Lieut.-Colonel R. H. ELLIOT said he assumed that all the Members present could agree with what Dr. McCrea said in his paper. One of the great interests of the communication, he thought, lay in the entirely different point of view of the ophthalmic surgeon of to-day in comparison with that taken at the time when he (the speaker) started practice in ophthalmology. At first ophthalmologists themselves tried to treat the kind of cases now described, but it was now recognized these were not eye cases. They were, therefore, sent to the general physician, the dental surgeon, the rhinologist and laryngologist, in the hope that they could discover and eliminate the cause, and thus get the patient well.

Dr. McCrea spoke of this condition as a clinical entity; he (the speaker) was not quite sure what was meant by this. Did the author distinguish these cases in essence from the closely allied ones which went under the names of cyclitis, iritis, and keratitis? Was there not recovery from the latter conditions in the same way, if a cause of sepsis was found and treated? Then again, myopic and senile retino-choroiditis were, he (the speaker) thought, to be placed in the same category. A man who had lived fairly long had collected a variety of organisms in one part or another of his body, and as his resistance became lessened with age, he was more liable to attacks from such foci of bacteria than he was in the more vigorous spring-time of life.

Mr. AFFLECK GREEVES said that Dr. McCrea's paper was very interesting, but he suggested that it seemed a pity to make a separate group of the cases which had been described; it should be, rather, a subgroup of toxic retinitis, the larger group including the albuminuric and diabetic cases. With regard to the cases of myopia and senile retino-choroiditis (referred to by Lieutenant-Colonel Elliot), pathological evidence inclined one to the view that they were degenerative, and not due to inflammation.

Mr. HARRISON BUTLER said that one source of sepsis likely to be overlooked, of which he had seen two or three cases, was a suppurating ingrowing toe-nail, which had been followed by iritis.

Mr. ERNEST CLARKE (President) said he understood a clinical entity to be an isolated group of a disease, and he did not suppose Dr. McCrea would object to the cases he had been describing being placed in a subgroup. Dr. McCrea's paper supplied material for reflection, and opened up many important fresh points. The suggestion that the condition was much commoner than supposed—owing, in such cases, to the macular region not being attacked, and to the patient consequently not having to consult an ophthalmic surgeon—was, he (the President) thought, very sound. Sometimes hæmorrhages appeared at the macula in high myopia on the top of retino-choroidal changes, and ophthalmologists looked upon that as part of the disease so common in high myopia. Was it possible that this was an added condition due to some sepsis? Would it not be wise to send such patients to a physician so that a toxic focus might be searched for? A good case had been made out for a careful routine search for septic foci.

Dr. MCCREA, in reply to Dr. Sutherland, who asked for more information concerning the bacteriology of the condition, said that an apology was due in that regard. He had been warned not to overstep his time allowance, and therefore did not read the full details of the cases. Moreover, only twenty-seven cases of the condition had passed through his hands, and again, it was only during the last year he had realized that these cases should not be included in the category of retinal hæmorrhages; so the bacteriology was not investigated in the early cases. He intended to publish the bacteriological findings in the later cases.

Dr. Sutherland asked why the retina was chosen for this condition, and he (Dr. McCrea) would answer that with a question: Why did an infection of the tonsils have as its sequel a diseased joint in one case, and in another fibrositis, and in yet another neuritis? Perhaps now the matter would be investigated and a reason found. In further reply to Dr. Sutherland, he said that in none of the cases had he found purpuric spots, and no bleeding gums. The blood was normal in the cases in which he had examined it.

The reason he wished the condition he had described to be considered a clinical entity was

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that it had a definite cause and could be cured by a definite mode of procedure. However, he did not object to fall in with Mr. Greeves' suggestion and call it a subgroup; he wanted to avoid terming it retinal hæmorrhage, for which there was, as yet, no definite treatment.

In reply to the President with regard to degenerative changes occurring in association with myopia, he quoted a case bearing on it. It was that of a myopic patient, aged 66, whose vision had been failing for many months, and for a year she had been unable to read. All her teeth were false, the tonsils septic, the right antrum dark to transillumination, there were scars on the right retina, and splashes on the left retina. The antrum was drained, the tonsils enucleated, and a vaccine was used. She was first seen in the middle of October; on November 22 her general condition was very much improved, and she could read Snellen 4. On January 10 there were still a few small splashes, very little scarring, and her vision was $\frac{1}{8}$ and Snellen 4, with glasses.

In reply to Mr. Harrison Butler, in one case which he had been unable to follow up the patient had an infection of the gall-bladder. The source of sepsis might be anywhere, and his habit was to make an exhaustive examination; an ingrowing toe-nail, as mentioned by Mr. Harrison Butler, if very septic, was a possible occurrence, though none of the patients had suffered from that.

In reply to Lieutenant-Colonel Elliot he considered that this condition, retinal petechiasis, was as much a clinical entity as iritis or cyclitis.

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President—Dr. DAN MCKENZIE.

Case of Persistent Post-Auricular Pain.

By PHILIP FRANKLIN, F.R.C.S.

FEMALE, aged 25. First seen February, 1926: history of pain over tip of left mastoid, persistent for one and a half years. No history of deafness or otorrhœa. Nose and accessory sinuses normal. Transillumination of sinuses and X-ray examination of sinuses, mastoid and teeth: negative. Left maxillary antrum punctured and washed out with no result. March, 1926: small portion of left middle turbinate in contact with the septum was removed; pain not relieved. May, 1926: doctor reported development of suicidal tendency. A Schwartze operation was performed on the left mastoid. Pain relieved for one month, but recurred; still persisting, though somewhat less severe. September, 1926: three injections of alcohol and novocain at weekly intervals were given over the painful area. Relief for three days after first injection: five days after second injection: no relief after the third. There is no obvious gastric disorder.

Discussion.—Mr. NORMAN BARNETT said the fact that the pain was better confirmed the idea that it had been a referred pain. He (the speaker) had had a similar case in a non-neurasthenic woman, who had few other symptoms except pain. There was a discharge from both ears, and he (the speaker) had therefore to perform a double mastoid operation at which extensive disease of the bone on both sides had been found. After recovery pain was absent but later returned. Medical and gynecological examination had given negative results. There was now freedom from pain and the patient was apparently normal. In the present case he (the speaker) suggested a medical and gynecological examination. He suggested further that if the pain persisted, ultra-violet rays should be applied by means of the Kromayer lamp, with sufficient exposure to cause definite reaction.

Mr. E. WATSON-WILLIAMS asked if this patient's left sphenoidal sinus had been examined: the pain was in front of the usual sphenoidal area of referred pain. She said that she had had catarrh for some time, but that it had been better during the last week, and there appeared to have been a coincident remission of pain.

Dr. HERBERT MARKS (Sydney) mentioned a somewhat similar case, which had given him (the speaker) anxiety, that of a nurse, aged 30. The pain had been bilateral, and had come on gradually. At times it was so severe that she had to go off duty. Indian paste and blistering gave relief temporarily, but when she returned to work the pain was as bad as ever. She had never had organic ear trouble, and hearing was normal on both sides. A skiagram suggested air-cells in the mastoid, and this suggestion was confirmed on operation. He (the speaker) had opened first the left mastoid and found a "honeycombing"; he scraped gently with a sharp spoon, and air bubbles came up through the cells. The anesthetist suggested that the condition should be called a "vacuum mastoiditis." No pus had been present, and he (Dr. Marks) had scraped away half the mastoid process. Healing had taken place, and the pain had completely disappeared from that ear. Two months later she had returned for operation on the other side, in which a similar condition was found. Within a fortnight she had returned to duty, and was now well. If this patient did not recover, hypnotic suggestion might be tried, as he (Dr. Marks) considered there was a neurotic element in the case. He had known patients in Australia cured by that means.

Mr. SOMERVILLE HASTINGS said this was a type of case frequently met with in practice. He asked whether the taste fibres going to the posterior third of the tongue had been investigated. In neuralgia affecting the geniculate ganglion and the facial nerve, there were symptoms closely resembling those in this case, and often accompanied by impaired taste in the posterior part of the tongue.

24 Franklin: *Persistent Post-Auricular Pain*; Powell: *Mastoiditis*

Mr. E. B. BARNES asked whether the Eustachian catheter had been passed when severe pain occurred in the ear. Removal of adenoids might help the patient.

Mr. RUSS WOOD said he also had had a similar case in a nurse, who had no signs of ear disease, or deafness. Tonsil and sinus investigation had given negative results. He (the speaker) had opened the antrum, but had found it quite normal. On the suggestion of a medical friend he had given large doses of ammonium chloride, and the pain had ceased for six months. At the end of that time the patient had returned, with complaint of pain in the other ear, and the same mixture had had a similar result.

Mr. H. TILLEY said he could not define the type of neuralgia which responded to ammonium chloride, but when such drugs as aspirin, pyramidon, salicylate and quinine failed, he (the speaker) had often found that ammonium chloride acted beneficially. It should be given in full doses, and with the addition of liquid extract of liquorice made a palatable mixture.

Sir JAMES DUNDAS-GRANT said that at the Central London Throat and Ear Hospital, chloride of ammonium was used in almost all cases of chronic middle-ear catarrh, some of which might have been called otosclerosis, and as after a time the patients' faces became ruddy, he (the speaker) concluded that the drug was a hæmatinic. Sir Thomas Grainger Stewart said that in vertical headache associated with leucorrhœa, chloride of ammonium acted most beneficially. Five to ten grains was the dose, and a little bicarbonate of soda, liquorice and syrup of lemon were added to make it less unpalatable.

Mr. FRANKLIN (in reply) said that the pain in this patient had been persistent, and had gradually been getting worse. Since the mastoid operation it had, however, become less severe. The sphenoidal sinus had been explored, and found normal. Judging from Dr. Marks' description, his case of suggested "vacuum mastoid" could not have any bearing upon this case, in which the pain was evidently real, and the patient not of neurotic type. Therefore he (the speaker) did not think that hypnosis would help much. The use of the Eustachian catheter had no effect upon the pain. No investigation regarding abnormality of taste had been made. He (Mr. Franklin) would, however, investigate this aspect of the case. He was grateful for the suggestion to give chloride of ammonium.

A Case of Mastoiditis with Perisinus Abscess and Lateral Sinus Thrombosis presenting Unusual Features.

By LESLIE POWELL, M.B.

R. T., AGED 19. First seen September 12, 1926. Admitted same day.

History.—Pain right ear, three weeks; discharge, three to four days. Swelling and tenderness behind right ear. Obviously ill; tenderness down neck, right side. Hearing: left, tuning fork conduction only; right, none. Mental condition sluggish.

First Operation: Same day, simple mastoidectomy, right; extensive perisinus abscess found depressing meninges, which filled out slowly.

September 15, 1926. One short rigor.

September 19, 1926. Temperature rose, but fell again, and general condition remained good.

September 23, 1926. Brawny swelling in neck.

Second Operation: Wound enlarged. Pus in diploë. More bone removed. Pus found coming from pinhole in lateral sinus, which was freely opened, a large amount of pus being evacuated.

Incision over internal jugular vein: pus found in carotid sheath leaking from small hole in internal jugular vein, which was freely opened. Vein was collapsed to root of neck, so ligature impossible. Recovery uneventful except that a tube had to be re-inserted on October 11, on account of further collection of pus in the vein, presumably leaking in from mastoid wound.

The case is of interest as showing (1) that plugging the sinus and ligaturing the jugular vein are not always essential to success, and (2) the very slight symptoms

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produced by the extensive sepsis in the vein, when once mastoidectomy has been performed.

There is some recovery of hearing in the left ear, suggesting that the complete deafness on admission was due to the pressure of the perisinus abscess and raised cerebral tension.

The very slow filling out of the meninges when the abscess was evacuated is unusual. In spite of all the pus, the neck wound healed by first intention except for the tube hole.

The patient sways slightly to the right, but vertigo has ceased.

Discussion.—Mr. J. F. O'MALLEY asked what the organism was. The pooling of the pus was very unusual.

Mr. LESLIE POWELL (in reply) said that no bacteriological examination of the pus had been made. He (the speaker) had hoped for comment on the degree of risk in leaving the clots to shut off the septic part of the jugular vein. It had been stated that the peripheral part of the clot was aseptic, therefore in this case he (Mr. Powell) had taken the risk, and the result was satisfactory. He asked how often one found cavernous sinus thrombosis following lateral sinus disease. He did not think extra risk was being run in that way because one could not shut off the connexion with the cavernous sinus.

A Case of Rudimentary Auricle.

By H. J. BANKS-DAVIS, M.B., F.R.C.P.

THIS handsome and intelligent boy, aged 4, has a right rudimentary auricle and no apparent auditory meatus. The mother states that he is "stone-deaf in this ear," but I do not find that this is the case. She says that "if he were a girl, this deformity would not matter," as it could be concealed, but she is afraid that he will be teased at school and handicapped in after life, and wishes to know if no operation can be done to remedy the deformity and make him hear.

Discussion.—Sir JAMES DUNDAS-GRANT said this case could be better discussed after a skiagram had been taken; it was difficult to trace a meatus.

Mr. W. M. MOLLISON referred to a case of deformed rudimentary auricle in an adult patient sent to himself (Mr. Mollison) by Mr. Gillies. On two previous occasions operation had been performed to open the external auditory meatus, and after each the hearing had been improved, but the meatus had again closed. He (Mr. Mollison) had opened the mastoid and the antrum and there was an abnormal arrangement of the ossicles; there was no external auditory meatus. Afterwards Mr. Gillies put in a skin-graft and held it in position with stent. When seen later the patient was certainly hearing half as well again.

Mr. A. R. TWEEDIE asked if any Member who saw a case of microtia in an infant would show it to the Section, so that the various reflexes might be tested.

Mr. J. F. O'MALLEY said he had been faced with a similar problem in a bilateral case. He had seen the child when it was a year old, and he had not yet decided what to do. Adult cases were a different proposition. He intended to have a skiagram taken to ascertain what the external meatus looked like.

Mr. SOMERVILLE HASTINGS advised that this case be left alone, as he had found in cases of imperforate meatus that there was very fair hearing. A girl with imperforate meatus on both sides had come to his (the speaker's) hospital. She wore no apparatus, and went to a secondary school. She sat in front of the class and heard fairly well. He (Mr. Somerville Hastings) suggested a carefully made rubber apparatus to hide the defect.

26 Just: *Lateral Sinus Thrombosis, without Otorrhœa; Recovery***Lateral Sinus Thrombosis, without Otorrhœa: Septicæmia;
Subsequent Tonsillectomy; Acute Nephritis; Recovery.**

By T. H. JUST, F.R.C.S.

Boy, aged 10, admitted to hospital March 31, 1925.

History.—Pyrexia for three weeks, up to 103° F.; shivering at times: some headaches. History of slight earache (right) at commencement of disease, which passed off after a few days. Never any discharge. Otherwise no physical signs.

On Admission.—No physical signs in chest or abdomen. Temperature, 104·2° F. Pulse, 110. Rigor after admission. *Blood culture:* Profuse growth of hæmolytic streptococci. *Right ear:* Membrane dull pinkish, intact, not indrawn. No mastoid swelling or tenderness. *Left ear:* Membrane dull, intact, indrawn. *Urine:* Albumin; some pus cells and hyaline casts.

April 9.—Schwartz operation (right), œdematous muco-periosteum in the mastoid cells. Lateral sinus explored: full of pus. Sinus obliterated, and internal jugular vein tied in the neck. For one month temperature remained high, up to 104° F., with occasional rigors.

April 22.—*Blood culture:* Hæmolytic streptococci.

May 6.—*Blood culture:* Sterile.

Ultimate gradual recovery, and healing of the wounds.

The patient was kept under observation, and as he had septic tonsils and adenoids, these were removed on October 6, 1926. The boy went home after the operation, and was brought up to hospital, on October 8, with a temperature of 104° F. Tonsil fossæ clean. No physical signs found. Blood culture, sterile. Widal reaction, T.A.B. negative. *Urine:* Albumin, + + +; sugar, 0; granular and hyaline casts; red and white cells.

October 16.—Blood urea, 0·24 per cent.

October 21.—Blood urea, 0·11 per cent.

During this time the patient was extremely ill; lethargic, but did not complain of any pain.

The patient has now recovered from the acute condition; but the urine still contains some albumin with a few cells and casts.

Discussion.—Mr. A. R. TWEEDIE said that Dr. Jacob, of Nottingham, had drawn his (the speaker's) attention to a paper by Dr. Alex. Fleming in *The British Journal of Experimental Pathology*, vol. vii, No. 5, p. 274, dealing with the bactericidal property of blood. From extensive experimental investigations Dr. Fleming had concluded that an intravenous injection of a 10 per cent. solution of salt induced the maximum efficiency of the bactericidal property, and suggested as a dose for an ordinary adult, 50 c.c.

Recently he (Mr. Tweedie) had had a case of septicæmia, in which there had been some lateral sinus thrombosis. The internal vein jugular had been tied but the ligature had had no effect, neither had the injection of 100 c.c. of antistreptococcus serum, but there had been immediate improvement when an intravenous injection of 50 c.c. of a 10 per cent. solution of saline had been given; the temperature had decreased from 105° F. to almost the normal degree, and had remained down. Two further injections had been given. The blood culture at the next examination had been negative, and the patient had apparently made a complete recovery, which was, no doubt, entirely due to this form of treatment, although he (Mr. Tweedie) regretted that the details of evidence were incomplete.

Mr. MOLLISON said that recently he (the speaker) had asked Dr. Eyre to try injections of mercurochrome for cases similar to this, and he had had two very successful results. One case was that of a girl who had septicæmia, following an operation for acute mastoiditis; streptococci were grown in pure culture from the blood. Dr. Eyre had injected mercurochrome on three or four occasions and recovery had ensued. The other case was that of a woman who had had a

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mastoid operation, and in whom what appeared to be blood infection had developed. He had not found any evidence of jugular thrombosis. There were lung infarcts on two occasions; the patient was losing weight and was very ill. In this case also Dr. Eyre had given three or four injections of mercurochrome, and the patient had made a good recovery.

Mr. HERBERT TILLEY said that in the spring of 1926 he had seen in consultation with Mr. Broughton Barnes, a patient (a boy) whose case had presented this problem of acute septicæmia. It had begun with earache and discharge, which had ceased before the speaker saw the patient; the tympanic membrane had then been normal, and the patient could hear the watch ticking six feet away. There was no pain in the ear, nor was the mastoid tender on pressure. There was no swelling in the neck, nor was there anything suggestive of jugular or lateral sinus thrombosis. In addition to the "swinging" temperature there was great pain over the symphysis pubis and behind the trochanter of the left hip-joint. In the daytime the boy felt fairly well, his mental condition was clear, but in the evenings he was ill. Later, symptoms of chest trouble developed, with pleural effusion, and the patient died. Luc, in his lectures, had recorded similar cases, which were first described by Körner. Briefly, these cases began with acute middle-ear suppuration and discharge, which cleared up, but before this happened symptoms of general septicæmia supervened and distal septic emboli appeared. In some cases the mastoid and lateral sinus had been opened up but no local foci of suppuration had been found. When he had found that there was a septic embolus over the symphysis pubis in this patient he (Mr. Tilley) had hesitated to advise a mastoid operation because it was unlikely that the general septicæmia would be relieved by that procedure.

Dr. DAN MCKENZIE (President) said that the delivery of the antiseptic directly into the circulation was a great step in advance of former means of treatment, and from all quarters one heard of general septic infections brought under control by this method. In his (the speaker's) experience the colloid silver salt had had a great effect in these cases, though pharmacologists denied that any ordinary chemical action was induced by colloids. But it almost seemed as if the all-important point was the intravenous administration and not the agent itself, since a large variety of remedies had been successfully used.

Mr. JUST (in reply) said that the patient's temperature had been high for three weeks before he entered hospital. He had been admitted as a case of typhoid, and at first there was no history of ear disease. A hemolytic streptococcus had been found in the blood; and this had led to the search for a septic focus. The history of earache three weeks before was only obtained on close questioning. The operation was an exploratory one, on account of the history, the rigors, and the temperature of 106·2°F. The lateral sinus was found full of pus. The patient's blood culture had remained positive for three weeks after operation. It was a remarkable thing that he recovered; this was probably due to the fact that there was never any involvement of the chest.

When the patient was operated upon later for tonsils and adenoids, his very high temperature and serious condition were due to severe acute nephritis. At the time it was difficult to satisfy oneself that the cause was not a septicæmia. An interesting question was whether the length of the pyrexia after the mastoid operation was not due to an underlying nephritis, which was masked by the known septicæmia.

He (the speaker) felt a little afraid of mercurochrome, as he had seen one or two patients in whom it had produced severe bleeding from the urethra and rectum. He had tried crystal violet intravenously, in a case of septicæmia; the reaction had been severe, but the patient recovered. He was grateful to Mr. Tweedie for the suggestion to employ 10 per cent. sodium chloride, as that was a simple procedure. The patient had had numerous doses of sensitized streptococcal vaccine (Besredka).

Case of Rodent Ulcer Metastasis.**By E. BROUGHTON BARNES, F.R.C.S.**

H. G., MALE, aged 49, leather worker.

History, 1921.—Rodent ulcer removed from forehead: section shown.

1923.—Left pre-auricular gland enlarged: treated by radium applications and enlargement then disappeared.

28 Barnes: *Rodent Ulcer Metastasis*; Gilhespy: *Extradural Abscess*

1925.—Swelling of upper part of pinna and adjacent tissues. First seen by exhibitor, November, 1925. Then had a perichondritis of pinna (thought to be due to radium) and a small warty outgrowth in meatus: section report "papilloma." Told to report monthly but failed to do so.

October, 1925.—Seen in present condition: scraping from meatus always showing great numbers of acid-fast bacilli (film shown). Reported after several examinations "not tubercle or leprosy, probably non-pathogenic." Guinea-pig injected October, 1926: Negative findings at post-mortem five weeks after.

Section from mastoid (slide) shows typical rodent ulcer running freely immediately above periosteum.

Examination.—Complete paralysis of upper facial fibres: no paralysis of lower fibres. Weber: to the left. A.B.C. left increased. C5 well heard. Caloric reaction, left: normal.

Shown as a case of rodent ulcer metastasis and for advice as to treatment. Will it be possible to save part of the pinna?

Discussion.—Mr. T. RITCHIE RODGER suggested that, before anything was done to the posterior part, the pinna and also the gland should be exposed to X-rays. He (the speaker) had had a case of tar epithelioma, in which the pinna had seemed to be even more affected than in this case, so that the patient was threatened with removal of the whole auricle. Operation was refused, and then X-ray exposure was suggested, and carried out, and within six months the lesion on the auricle had disappeared. There was, however, a considerable loss in the outer line of the auricle. In the present case the condition of the pinna might be largely inflammatory, in spite of the induration.

Mr. TILLEY suggested irradiation of the indurated parts, which, even if it did not cure, would make a slighter operation possible; already the facial nerve was partly involved. Recently, he (Mr. Tilley) had had a case of a large rodent ulcer of the left nasal vestibule, which was irradiated, and after six weeks it had disappeared, except for the resulting smooth, healthy scar.

Dr. DAN MCKENZIE (President) said he wondered whether the term metastasis had been correctly used here. In these cases he (the speaker) had successfully used diathermy.

Mr. BARNES (in reply) said that with regard to metastasis, when he had seen the case a year ago the swelling was entirely under the skin; there was no ulcer. In 1923 a gland near the ear was treated by radium. He (Mr. Barnes) would expose the pinna to X-rays. Regarding the use of radium, he was afraid that the rodent ulcer was already in the mastoid. The facial nerve seemed to be caught outside the temporal bone. Four weeks ago the paralysis was absolute in the upper part of the face, but there was none in the lower part.

Case of Extradural Abscess following Mastoid Suppuration.

By F. BRAYSHAW GILHESPY.

PATIENT, male, aged 25.

History.—Otorrhœa since childhood, following removal of adenoids. Seen June, 1926. Symptoms of mastoid suppuration. Perforation through outer attic wall.

Operation.—Extradural abscess evacuated from roof of mastoid antrum; conservative mastoid operation, bridge and outer attic wall removed: membrana tensa not removed. Hearing is good in this ear; membrane can be seen.

Discussion.—Mr. TWEEDIE said the result was excellent, but he asked what was the extent of the previous pathological lesion and what parts were removed by operation. There seemed to be no remnant of incus present now.

Mr. GILHESPY (in reply) said he had shown the case as illustrating his (the speaker's) usual method of dealing with attic suppuration. He had been carrying out removal of the incus also; he had had good results, and could confirm what Mr. Jenkins said about it.

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Have we a Resonance Theory of Hearing, or only a Resonance Hypothesis?

By GEORGE WILKINSON, F.R.C.S. (Sheffield).

DR. H. Hartridge, in a lecture delivered to this Section last year, reviewed the experimental data on which may reasonably be based the belief that tones are analyses in the internal ear by means of resonance. To these data he himself has made notable contributions. He left us, however, without any positive guidance as to the actual mechanism of resonance within the cochlea.

My own view of the resonance controversy is that nearly everybody recognizes that *all* the positive evidence is in favour of the resonance hypothesis, and that this hypothesis offers a complete solution of all the main facts of hearing, if it could only be accepted as a mechanical possibility. We cannot, I think, rest satisfied with the conclusion that the internal ear behaves as a resonator, but that it is impossible to form any idea as to how it resonates.

My own attempts to contribute to the solution of this problem have been in the direction of making a working apparatus which should embody the physical conditions found in the cochlea, and by submitting it to vibrations of different frequencies, to discover whether we do actually get a series of localized responses at levels varying with the frequencies employed; and I think the models I have produced actually show this graduation of response according to pitch levels, and that they illustrate, though in an unspeakably coarse, clumsy, and remote fashion, the wonderfully delicate resonance mechanism of the cochlea. Dr. Hartridge will not admit that any conclusions can be drawn from the working of these models. He showed on the screen certain published photographs which he admitted were the worst of the series, and which, taken apart from the rest of the series, are certainly far from convincing. I propose to show here slides of the whole series with a view to correcting what I consider to be the erroneous impression given by these photographs of the more defective portions of the scale when divorced from their context. Also, I will ask to be allowed once more to give a demonstration of the actual working of the models, as I feel strongly that the photographic reproductions form an inadequate basis for judging of their performances.

It will be noticed that the more diffuse responses occur at the upper end of the scale. We get good, well localized responses up to about 400 d. v. per second; beyond that point, though the ascending series of responses is continued in the positions we should look for them, the effect is marred by serial responses distal to the anticipated responses.

What is the cause of these diffuse serial responses, and why do they affect chiefly the upper end of the scale? My own view is that they are the result of over-stimulation. They are less marked, or absent, when the tuning forks are applied with great care, so as to give a just perceptible movement of the indicator powder. To obtain a response that can be photographed necessitates the application of more force than is required to evoke the minimal response. All resonators break down under forcing, and the larger the damping factor the more readily are they thrown into forced non-resonant vibration. The fibres of the basilar membrane in the models (as in the cochlea itself) are well-damped resonators, and consequently the degree of force which can be applied to them without exciting diffuse vibration is limited. The relatively greater susceptibility of the upper end of the scale to these forcing effects is, I believe, a defect inherent in the method employed to record the vibrations, i.e., the indicator powder of blue enamel, the movements of which show where vibration is taking place. This powder gathers in a heap over the site of

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maximum vibration. It does this because a vortex, or eddy, is set up in the fluid by the vibration of the membrane at that level, which sweeps the powder together in a heap. In order to create a whirlpool sufficiently vigorous to transport the powder grains, a certain *amplitude* of vibration is necessary. The amplitude being the same, the energy of vibration varies as the square of the frequency. To obtain the same amplitude of vibration at the 800 d. v. level requires the communication from the tuning fork to the resonator of sixteen times as much energy as is necessary at the 200 d. v. level. Consequently, we get forcing effects much more readily at the upper part of the scale. That these serial effects do follow "forcing" may readily be shown by producing a forced vibration, say, at the 400 d. v. level. With a carefully restrained application of the fork we get a well localized response, with just a suspicion of a second vibration on the distal side: with vigorous stimulation we get a whole series of responses.

Another problem is to account for the occurrence of these atypical responses in series. I believe the reason for this to be that, owing to the films of fine gelatinized paper in which the wires are embedded so as to form a continuous membrane, we have a degree of longitudinal continuity which is undesirable. It does not conform to Helmholtz's ideal condition, viz., a membrane with transverse, but without longitudinal, tension. Standing waves set up in such a membrane at one level will tend to produce a series of secondary standing waves, equally spaced along the membrane.

I admit freely that the models which I have demonstrated from time to time are full of defects. They are useless for illustrating the finer details of the action of the cochlea. I have devoted much time and trouble to the attempt to minimize these defects, with only qualified success. The technical difficulties are very great, and I am afraid we can only expect rough results. Still, I do not think the defects are so great that they warrant the total rejection of any positive indications which they afford. So far as I can see, there is no other explanation of the graduated responses according to pitch levels which they show, other than that they are resonance effects. The results obtained, so far as they go, are perhaps the most direct evidence of the nature of the resonance mechanism in the cochlea which we possess. I think it would be a pity to reject them on the ground that they do not go far enough.

The essential feature of the theory of cochlear function which I have put forward is that the fibres of the basilar membrane are differentiated by length, tension, and mass, just as are the suite of strings in a stringed musical instrument. The differentiation by length is something like 1 : 3. That by tension is effected by the spiral ligament as shown by Gray in 1900. The differentiation by mass, which is required to complete the parallel, is due to the "loading" of the basilar membrane by "columns of fluid" intervening between each successive segment of the membrane, and the round and oval windows. These must oscillate synchronously with the segments of the membrane when the latter are vibrating. In my view, it is only by admitting the existence of all these three modes of differentiation that a coherent resonance mechanism can be visualized.

Dr. Hartridge will not admit the validity of the theory of the fluid load. As I understand, he sees no reason why the fibres of the basilar membrane, though immersed in the cochlear fluids, should not vibrate with the same natural periods which such fibres would have in air, or *in vacuo*. Such a view appears to me to be fundamentally unsound. If entertained, it renders hopeless any idea of attributing to the fibres of the basilar membrane a range of periodicities consistent with the known limits of audible tones. As Helmholtz says, "That such short strings should be capable of corresponding with such deep tones must be explained by their being loaded with all kinds of solid formations; the fluid in both galleries must also be considered as weighting the membrane, because it cannot move without a kind of wave

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motion in the fluid." When one comes to examine the matter more closely, one sees that the fluid which "weights the membrane" so far outweighs both the intrinsic mass of the fibres themselves, and that of the solid structures connected with them, that, for purposes of computation, these may be left out of account. The main factor for all practical purposes is the fluid load.

In order to illustrate the bearing of the fluid load, apart from any other factor, on the periodicity of an immersed membrane, I have constructed a very simple piece of apparatus [apparatus shown]. It consists of a cylindrical brass box in two halves, divided by a stretched rubber membrane which has been introduced between them and fixed into position by a clamp. Two pairs of tubular arms of different lengths can be screwed on to the box. The ends of the arms are closed by loosely fitting wooden discs, attached to rubber membranes, which can be fixed in position by a watertight junction of rubber strapping. The whole is filled with fluid and sealed up. The disc closing one of the arms carries a wire pointer. If the opposite disc is tapped smartly with the finger the fluid contained in the apparatus is set in vibration, and the rate of vibration can be recorded by photographing the excursions of the pointer on a falling photographic plate (as used in the electro-cardiograph). I have here some slides made from such records [slides shown].

We can vary the fluid load in two ways: (1) By using plain water to fill the apparatus, and varying the length of the fluid columns by attaching arms of different lengths. One pair of arms gives fluid columns of total length 4 cm., and the other of total length 16 cm. If the theory of the fluid load is sound, the periodicity of the membrane when loaded with the 16 cm. columns should be twice as great as when loaded with the 4 cm. columns. As you will see, the records agree fairly closely with the ratio 2 : 1 required by theory.

Another way of varying the load is to use fluids of different densities to fill the apparatus. For this purpose I have employed water (specific density 1) and a concentrated solution of magnesium sulphate (specific density 1.21). The vibrational frequencies in the two cases should be inversely proportional to the square root of the densities; that is, in the ratio 11 : 10. Here, too, we find the graphic records which I show on the screen in good agreement with the theoretical values. We may note also that the natural frequency of the membrane when vibrating in air is reduced, by loading with 4 cm. fluid columns from 250 d.v. to 37.5 d.v. in one experiment, and from 330 d.v. to 50 d.v. in another experiment (the tension on the membrane being considerably less in the first experiment than in the second).

In view of these results I do not think it can be maintained that the periodicity of vibration of a stretched membrane immersed in fluid is the same as that of the same membrane vibrating in air.

The influence of the fluid load can also be demonstrated by means of the resonator model. If this is set up with a series of "basilar fibres" all of the same length, and under the same tension throughout, whatever difference is found in the pitch levels of the responses to different tuning forks must be due to the variations in the amount of the fluid load. The load is proportional to the sum of the distances of the vibrating sector from the round and oval windows. The distance of the responses to different frequencies of vibration should vary inversely as the square of the frequencies. For frequencies an octave apart the lower tone should set in vibration a sector four times further from the proximal end of the scale than the higher tone. The photographs of the response to tones of 200 and 400 d.v. bear out this expectation. The 256 d.v. response is in an intermediate position. Theoretically, it should be approximately twice as far from the proximal end as the 400 d.v. response. The results are in good agreement with theory. The upper 400 d.v. response is accompanied by a whole series of decreasing secondary responses as in the other cases shown. These are due, I believe, to the degree of forcing necessary to bring it out sufficiently clearly for photographic purposes.

I submit, therefore, that the experimental evidence in favour of the validity of the theory of the fluid load is fairly strong.

If we are prepared only to go to the length of saying that there is evidence that the cochlea acts as a resonator, but none to show in what way it so acts, then we can only speak of the resonance *hypothesis*. If, on the other hand, we admit the threefold differentiation of the basilar fibres by length, tension and mass, which latter mode of differentiation presumes the validity of the theory of the fluid load, and if, further, the evidence of the models is considered worthy of consideration as illustrating the mechanical action of the cochlea, then I think we may claim to have a fairly comprehensive resonance *theory* of hearing capable of explaining in some detail the method by which tone impressions are transformed into sensations of tone.

In conclusion, may I ask those who are interested in the subject to allow me to demonstrate to them the actual working of the models, and not to rely entirely on the photographic representations of their reactions, before coming to a conclusion as to the value of the evidence in favour of the resonance theory which they are capable of affording.

The Use of Weber-Liel's Intratympanic Tube in Chronic Eustachian Catarrh.

By Sir JAMES DUNDAS-GRANT, K.B.E., M.D.

FROM the shape and direction of the Eustachian tube (fig. 1) the tip of an ordinary catheter tends to impinge on the outer wall and become blocked (fig. 2). The Weber-Liel "intratympanic" tube (fig. 5) adapts itself within limits to the curvature of the Eustachian tube and can be introduced for some distance beyond the tip of the catheter (fig. 3). This is facilitated by inclining the outer extremity of the catheter laterally outwards and upwards (fig. 4), and at the same time rotating it slightly on its long axis so that the beak points more upwards. The intratympanic tube acts as a bougie with the additional safeguard that the correctness of its position may be ascertained by auscultation during inflation. I have found unexpectedly good results from its use in cases intractable under simple catheterization.

The *modus operandi*, step by step, is as follows:—

Spray the nasal cavity with the novocain-adrenalin solution.¹

(1) Paint the deeper part of the cavity and the side wall of the naso-pharynx with the same solution by means of a small wisp of non-absorbent cotton wool twisted on a Jobson-Horne wool-holder.

(2) Introduce the silver catheter and test the correctness of the position by means of the Politzer bag and auscultation tube.

(3) Spray a little of the novocain solution through the catheter.

(4) Inject two drops of paroline through the catheter and blow it in by means of the Politzer bag.

(5) Introduce the gum-elastic Weber-Liel tube through the catheter till it impinges on the outer wall of the Eustachian tube.

(6) Move the outer end of the catheter outwards and press the inner tube a little further in. Then, or at the same time, rotate the catheter slightly on its long axis so as to raise its tip and at the same time raise the outer end without letting the inner end shift. The inner tube can then in most cases be pushed still further up the Eustachian tube.

¹ The novocain-adrenalin solution is as follows:—

Novocain	...	...	...	10 gr.
Adrenalin solution (1 per 1,000)	...	...	...	13 minims
Solution of sulphate of potash (2 per cent.)	1 drachm
Solution of carbolic acid (0.5 per cent.)	up to	½ oz.

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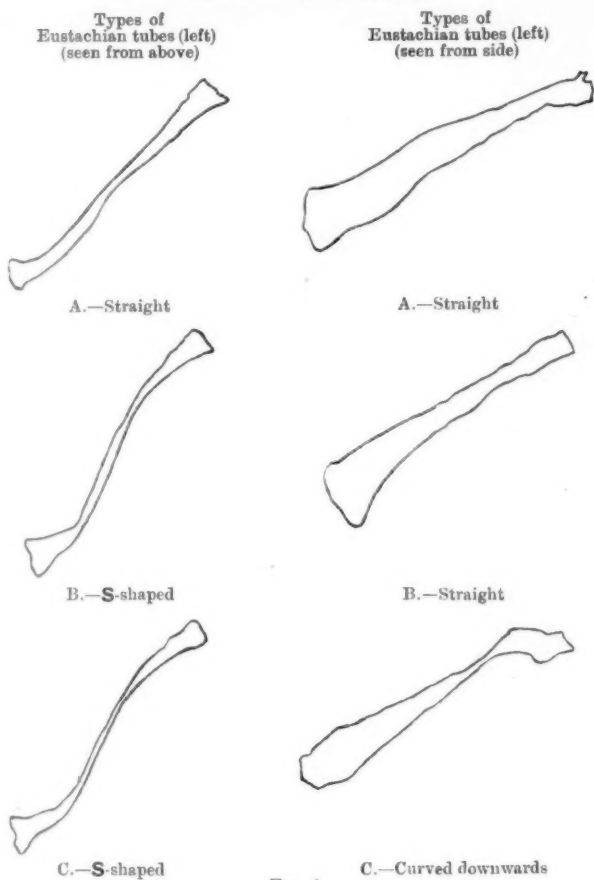


FIG. 1.

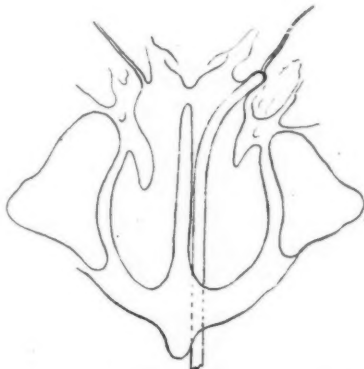


FIG. 2.—Tracing from frozen section (Braune) showing direction of the Eustachian tube, the tip of the catheter impinging on the outer wall.

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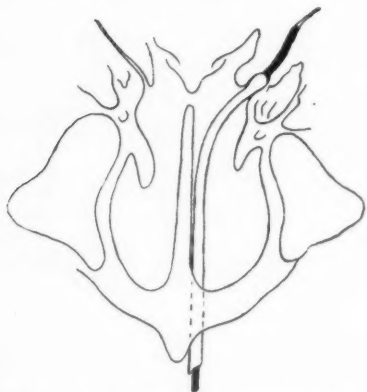


FIG. 3.—Same section, with flexible intra-tympanic bougie passed through the silver catheter.

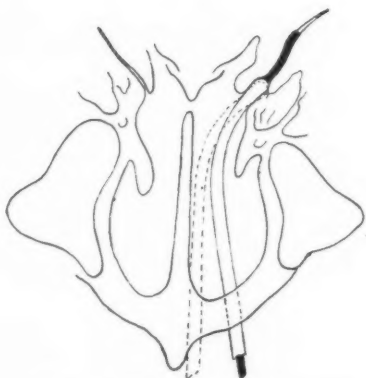


FIG. 4.—Same section, with manoeuvre for placing the tube of catheter and bougie in the most favourable position for penetration.



FIG. 5.—Rigid silver Eustachian catheter through which is passed a flexible gum-elastic Weber-Liel inner catheter.

Temporal and Zygomatic Abscess in Chronic Middle-Ear Suppuration.

By ARTHUR CHEATLE, C.B.E., F.R.C.S.

DURING the last year, two cases very similar in character have been under my care at King's College Hospital. Both were in female patients who had had a chronic discharge from the left ear for many years.

A large fluctuating swelling was present in front and above the auricle with surrounding cedema which in one case spread to the eyelids and cheek; the mastoid region was only slightly cedematous. The superior and postero-superior deep meatal walls were greatly swollen, almost blocking the passage. At operation a large amount of offensive pus was evacuated, but no carious opening could be found in the surface of the bone; the bone was found to be of the acellular type with a very thick and dense outer antral wall. The antrum contained pus, granulation tissue and cholesteatoma under considerable tension. There was extensive erosion of the outer attic and postero-superior deep meatal walls and it was evident that the pus had tracked along the meatal roof between the soft meatus and the bone to reach the zygomatic and temporal regions.

This is a distinct but uncommon type of complication of chronic middle-ear suppuration.

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President—Dr. W. ALDREN TURNER, C.B.

Clinical Meeting at the Maudsley Hospital, Denmark Hill, S.E. 5, held January 11, 1927.

CASES.

Juvenile Tabes with Optic Atrophy and Recent Psychosis, Probably General Paralysis.

By ALAN RANDLE, M.D., and EDWARD MAPOTHER, M.D.

W. W., MALE, aged 22. Blindness, which is now complete, is alleged to have gradually developed after falling at age of five.

Double primary atrophy. Left pupil larger than right. Reaction to light completely absent in both and that to convergence very slight. Nystagmoid jerkings on lateral movement of eyes in both directions. All tendon reflexes completely absent. Some Rombergism. Walks with stamping gait and feet markedly turned out. Superficial reflexes brisk but marked universal blunting of pain. Bladder emptied with difficulty and incompletely, no incontinence. Slight kyphosis.

Stated to have been normal mentally until recently, is now incapable of connected conversation, and reiterates single short sentences. Sometimes obeys simple orders but frequently resents all interference, behaving like a fractious child.

Report: Examination of Cerebro-spinal Fluid.—Wassermann reaction + 40 + ; cells + ; protein + ; Lange 5555554321.

Blood.—Wassermann reaction + 40 +.

Uterine Tumour of Doubtful Nature with Ideas of Reference and Thought Reading.

By ALAN RANDLE, M.D., and EDWARD MAPOTHER, M.D.

FEMALE, aged 40. Was hospital nurse during the war and afterwards in charge of an old lady in London.

About 1920 she began to develop abdominal swelling and states that at the same time, gossip about her started among those who attended the same church as herself. She alleged this gossip concerned misrepresentations she had made with a view to obtaining a passage to America, but this is clearly a substitute for anxiety concerning real or fancied suggestions that she was pregnant. Left London for northern town where she remained five years, and states that the talk was continued and gradually increased. Returned to London end of February, 1925, and was admitted to St. Peter's Hospital, Vallance Road, a few days later, complaining of weakness and swelling of the abdomen. Denied continuous presence of swelling, but said that it often recurred.

Laparotomy April, 1925. Tumour, found to present appearance of gravid uterus.

After remarks by a nurse about the folly of misleading the doctors, patient developed acute hallucinatory psychosis with delusions of persecution. Acute symptoms subsided in two months.

In September, 1926, when it had become obvious that the diagnosis of pregnancy was mistaken, the abdomen was again opened by Dr. Alan Randle and hysterectomy performed.

2 Wakeley—Mapother: *Gunshot Wound*; Barkas: *Psychosis*

The uterus contained a large tumour which has been lent for exhibition by the Royal College of Surgeons, to which it was presented. Stated to be myoma malignum.

Patient absolutely denies coitus. She still complains of her thoughts being read. Shows an extreme degree of shame, hiding her face, especially from any man.

Gunshot Wound in Right Pre-Frontal Region. For Consideration of Surgical Treatment of Recent Epilepsy.

By C. P. G. WAKELEY, F.R.C.S., and EDWARD MAPOTHER, M.D.

R. H., AGED 30. Shot himself through the right frontal lobe in September, 1921, bullet entering in the temple and emerging near the middle of the forehead.

Apart from moderate neurasthenia and neurosis there have been no mental signs. There has been one definite "fit" recently, and he has lost consciousness on a few occasions previously.

X-ray shows the presence of foreign bodies around the openings in the skull.

Psychosis Associated with Pressure from a Disc of Bone Replaced after Trephining.

By MARY BARKAS, M.D.

MRS. K., aged 47.

Admitted July 23, 1926, suffering from depression, sense of depersonalization, general feeling of mental incapacity, especially inability to appreciate the course of time; also tenderness over left frontal region with pricking sensations, and feeling of pressure over left side of head.

History.—Twenty-two years ago suddenly felt "queer," as if she had had a stroke—not really unconscious but could not speak, and the lower part of her face "felt queer" and numb (not known whether this was transient paralysis); soon this felt all right, but since then she had had severe headaches and a feeling of pressure on the left side of the head. Finally a small trephine opening was made in the left frontal region, and she was told that the bone had been found thickened, and had been thinned and replaced. After this she was better for eight years, but relapsed after the birth of her child fourteen years ago, and has complained of the present symptoms, more or less, ever since; recently suicidal.

On admission her mental state was one of depression, and subjective sense (not borne out by objective examination) of loss of memory, concentration and thinking capacity. Physically, she had marked tenderness mesial to and above the trephine hole, nystagmus of rotatory type, fine to left and coarser to right, vertigo without rotation of objects, and a sluggish left ankle-jerk. Blood Wassermann reaction negative.

She was regarded as probably hysterical, but X-ray examination showed that the disc of bone from the trephine hole was displaced; Mr. Wakeley operated and removed this, finding that it had produced about $\frac{1}{4}$ in. depression on the surface of the brain. After the operation the feeling of pressure in the head was at once relieved, the mental symptoms cleared up gradually, and the nystagmus vanished. The left ankle-jerk remained sluggish and she still complains of occasional numbness of the left arm and leg, but otherwise she continues well.

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Psychosis showing Recovery after Relief of Intracranial Pressure of Doubtful Origin.

By MARY BARKAS, M.D.

MRS. H., aged 31, married. Admitted to the Maudsley Hospital, September 11, 1924.

History.—Normal mentally and physically before marriage. Machinist. Married 1921; husband labourer. October, 1922, birth of child; eight days later was "raving," and in the infirmary for a week, then seemed better, but at home became depressed and attempted suicide by gas and cutting her throat. In Cane Hill Mental Hospital till April, 1924, still depressed, but removed against advice.

On admission: simple anergic depression, memory unimpaired, sleepless, constipated: able to do simple work under supervision but did not occupy herself spontaneously. No delusions; mental stress—desertion by husband. Physical state suggests hypothyroid or other endocrine disorder; face, hands and feet puffy, hair becoming scanty, menstruation irregular. Nutrition good. Heart normal, blood-pressure $1\frac{2}{5}$ 90. Urine normal. No neurological signs—optic discs slightly pale. Blood and cerebro-spinal fluid: Wassermann reaction negative; blood urea 18 mgm. per cent. (rather low).

Progress.—On thyroid administration 5 gr. b.d. her pulse became 90 and her depression and constipation abated, but she still remained anergic and the oedema of the ankles and face persisted, while she gained 11 lb. in weight by January, 1925.

In February, 1925, she had become more dull and anergic again, and was on several occasions slightly confused and had incontinence of urine; no physical cause ascertainable—apparently simple apathy. No longer employable. This state continued for some months, and her condition was regarded as one of chronic anergic depression tending to dementia.

In June, 1925, she had an attack which was regarded as hysterical, with convulsive movements of the legs; pulse 70, not unconscious, no cyanosis. Next day temperature 100° F., pulse 128, respiration 56; another attack with leg movements—at first no response to questions, later quite clear; tendon and skin reflexes normal, blood-pressure normal, pupils unequal and sluggish to light but brisk reaction on convergence, coarse tremor of tongue, retention of urine. Remained having attacks at intervals, sometimes screaming, pupil reactions varying to light, the right usually sluggish even when left brisk. Lumbar puncture—fluid under very low pressure—blood contamination; but Wassermann reaction negative in blood and in fluid almost free from blood.

Four days later fell in epileptiform fit with cyanosis, deep unconsciousness, passing urine and biting tongue—limbs rigid with legs extended. Plantars first absent, then left extensor, ankle clonus both sides, abdominals absent; coming round had smacking movements of lips, conjugate deviation of eyes to left with jerky movements to left, right pupil larger than left, both reacted to light and later both dilated. As soon as she was fully conscious she spoke clearly; said she had no warning and no headache.

Next day there was marked weakness of the right leg with increased tendon reflexes, ankle clonus and extensor plantar, and a day later the weakness had extended to the right arm and right side of the face. She remained dull and stuporose for a week with varying reflexes, the left plantar once being extensor and the right once doubtful flexor. Discs slightly congested, especially left.

On July 5 the right leg had become flaccid with diminished reflexes and flexor plantar; she was somnolent, but seemed to resent movement of the head to the

4 *Barkas: Case for Diagnosis; Moodie: Epilöia*

right; temperature varied from normal to 101° F., left disc blurred. Slight weakness of right face and hand, present on July 2, had now disappeared. Transferred to King's College Hospital on July 6; operation by Mr. Wakeley. Left subtemporal decompression—considerable intracranial pressure and surface of brain hyperæmic—no tumour localized.

Cerebro-spinal fluid just before operation clear, no globulin, trace of sugar, cells 130, chlorides 0.8 per cent. (examination made by two pathologists). Cells degenerate. At first very restless and suicidal and developed some hernia cerebri, but gradually improved and has become perfectly normal mentally and physically and is now (January, 1927) active and completely well.

Case for Diagnosis between Psychogenic Depression and the Post-encephalitic Syndrome.

By MARY BARKAS, M.D.

MISS B., aged 28. Admitted December 7, 1926, suffering from depression, insomnia, lack of energy, tremors of hands, pains in back and epigastrium. Duration eighteen months. Symptoms date from period of mental stress following breaking of an engagement owing to ill-health of fiancé (tuberculosis). Her father died from tuberculosis eight years ago.

Two years ago history of illness considered to have been influenza, no diplopia; appearance suggests mild Parkinsonism, and hyoscine produces some increase of energy and no drowsiness or ocular symptoms.

Patient denies present conflict over engagement, but effect of illness is to limit her social contacts with friends, as she has lost interest and feeling and has no energy. She lies awake unable to sleep, troubled with compulsive thoughts of the past, of the engagements of her friends, etc., which are so vivid as almost to become hallucinations, though she has complete insight.

Diagnosis? reactive depression, functional neurosis, or encephalitis lethargica.

A Case of Epilöia.

By WILLIAM MOODIE, M.D.

THE patient, a girl, aged 15, was brought to the Out-patient Department here on November 2, 1926, on account of her mental state, which was one of depression with agitation.

She is the eighth of twelve children, of whom one was stillborn. One sister is psychotic, with depression and delusions of a persecutory nature, and the father had a delusional attack about twenty-three years ago, but recovered at home and has kept well ever since. There is said to be no further history of mental abnormality in the family.

As a child of six months the patient suffered from convulsions which were said to be due to teething and lasted about a year. At the age of three she had an attack of diphtheria, but there was no paralysis. The tracheotomy scar is still visible. She was rather backward at school, but reached the top standard, and took an active interest in social activities such as that of the Girl Guides, and she was an expert swimmer. The adenoma sebaceum, which was noticed first at the age of two, has persisted since without much variation.

In September, 1926, she was noticed to be very shaky on rising in the morning, and to be becoming depressed, easily upset, and prone to giving way to tears.

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Her condition became gradually worse, ideas of self-reproach developing, associated with an abnormal interest in religion. Three days before admission she was much upset by a sermon which she heard on the "wireless," and since then she refused to talk and was exceedingly resistive in every way.

On admission she refused to answer questions. She appeared very apprehensive and frightened, and shrank away when approached, occasionally blurting out, "I did not do it"—"I did not do the murder." She could give no indication as to what the murder was, nor throw any light on the reason for her terror or her words.

Physical examination showed her to be healthy, the adenoma sebaceum was confined to the usual "butterfly area" on the face and a few scattered spots on the chin and the upper part of the chest. There were a few small patches of leucoderma on the legs and trunk. There was acetone in the urine.

She remained in this state for ten days and then brightened up. She then spoke freely and pleasantly. She stated that she remembered having talked about a murder and being frightened, but could give no reason for this.

She has recently had several "fits." At the commencement of these she clenches her teeth and looks extremely terrified, holding the body rigid. After about half a minute chronic muscular contractions commence and persist for a minute or two, and gradually the fit passes off. The pulse-rate does not alter during the attack, nor does she bite her tongue or pass urine. These attacks do not appear to coincide with the menses.

Her general mental development is low, but not markedly so, and her physical development is good. She now appears cheerful and her mental confusion has to some extent cleared up; there have been no "fits" for about a month.

General Paralysis treated by the Organism of Relapsing Fever.

By WILLIAM MOODIE, M.D.

Mrs. D., AGED 42. Admitted September 29, 1926, suffering from insomnia and difficulty in speech, said to be of three months' duration. Later, history given of three years' change of mentality, carelessness about work and home, occasional loss of memory and confusion, but patient had lived alone and earned her living up to the time of admission.

On admission her speech was scanning rather than slurred, she had tremor of the face, but no other physical signs. Mental state one of anxiety, and she gave what seemed a clear account of herself, though from the later history it was apparently somewhat euphoric. Consciousness clear, no disorientation.

Blood: Wassermann reaction + 40 +. Cerebro-spinal fluid: Wassermann reaction: + 40 +, cells and protein + + +. Lange, 5555555432.

After lumbar puncture, right pupil reacted less well to light than did the left. Other reflexes unchanged. Inoculated with the organism of relapsing fever October 4, 1926. (See charts shown.)

After first rise in temperature speech much improved and general tremors diminished, but after second rise she became rather drowsy, confused, and unsteady on her feet, and began to be doubly incontinent.

On October 27 she was for the first time hallucinated for sight and hearing. After this the course of her temperature became irregular and she showed signs of heart failure to a varying degree until November 12, 1926, when she developed signs of broncho-pneumonia and died. Tryparsamid had been given on November 4, 1926, but failed to abort the fever.

6 Moodie: *Case of Neurosyphilis*; Dawson: *General Paralysis*

Post-mortem findings in brain definitely those of general paralysis of the insane, but no spirochaetes either of syphilis or relapsing fever were found. During the two first rises of temperature a few spirilla of relapsing fever were found in the blood—not otherwise.

Case of Neurosyphilis, for Diagnosis between the Interstitial and Parenchymatous Forms.

By WILLIAM MOODIE, M.D.

MRS. S., aged 52. Widow. Admitted November 5, 1926, suffering from confusion and aphasia.

History.—Healthy until three weeks ago. Husband drank himself to death in 1920, and since then patient has had considerable financial stress, with great anxiety recently. Three weeks ago she had some kind of seizure in the street, and since then had been unsteady on her feet, drowsy and confused, unable to write and having great difficulty with her speech.

On admission, she understood what was said to her, but could only make a feeble attempt at writing either spontaneously or to dictation, and in speaking she frequently failed to find the word she wanted or used the wrong word, recognizing the error when she spoke the word. She showed a very variable degree of confusion, defect of memory for recent and remote events alike, and disorientation and some perseveration. Physically she showed a general drowsiness with frequent yawning and irregular sighing respiration; heart sounds weak; pulse, poor tension. Arteries hard. Slight weakness of right leg and face in half movements; tremor affecting face, lips and tongue. Nystagmus fine to right, coarse to left, and left eye seems to wander out at times; ptosis left eye; pupils, right larger than left, both slightly irregular, light reaction present but sluggish and redilate. Hearing less acute on right. Urine normal. Right abdominal reflex absent, left present, other reflexes brisk and equal; plantars both doubtful. Objects better recognized in left hand, though shape and hardness felt in right, and movements of utilization of objects normal in both. Gait unsteady. Blood: Wassermann reaction + 40 +; cerebro-spinal fluid: Wassermann reaction, + 8 +; cells and protein + +, Lange 5555555321.

Progress.—Stabilarisan and mercury rapidly produced a very marked improvement in both physical and mental condition.

Diagnosis and Prognosis? only vascular lesion.

General Paralysis with "déjà vu" Phenomenon.

By WILLIAM S. DAWSON, M.D.

MALE, aged 41. A change of disposition has been apparent over a period of about two years. He became difficult, irritable, and lost interest in his usual pursuits. About a year ago he said that a long time ago he had had visions of things happening at the present time.

On admission, July, 1926, he was considerably depressed and made a number of hypochondriacal complaints; especially he compared his present incapacity with previous athletic attainments, the latter seeming to be rather exaggerated. Altogether his statements tended to be expansive.

Physical Signs.—Good general condition; slight lingual, facial and digital tremors; exaggerated deep reflexes; pupils, equal and active; blood and cerebro-spinal fluid strongly positive to usual reactions.

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He was given malarial treatment, with eight rises of temperature to 103° F., followed by eight weekly injections of 0.3 grm. stabilarsan.

After recovering from the effects of malaria he became moderately euphoric and quite departed from his hypochondriacal outlook; he was no longer depressed and stated that he felt very well, though he complained that he could not concentrate as well as he could wish. He became interested in a newspaper competition concerning the publication of unusual experiences and talked freely about having had visions of present events. The following is an extract from his statements:—

"I seem to have been shown things that I have seen, read about, or discussed years ago. I recollect whole experiences which have occurred to me and which seem to be repeated to-day. The number of *Punch* which I was looking at yesterday seemed a replica of one I had read years ago although it bore a recent date. I feel that I have dreamed years ago about the conversations which I hear daily, and about the experiences of the other patients here. I begin to realize that the whole of my experiences here are the fulfilment of a dream, or a series of dreams, even down to the most minute details of daily life. Most of them, I now remember, appeared to me, at the time or times, as a sort of cinema film. I now know that lots of good things are coming my way . . . you who read this will readily understand my hesitation in such a matter as it really amounts to prophecy or prevision . . . the full revelation of the glorious knowledge that has just commenced and is not yet complete."

He has not recovered his working capacity, although there is no obvious impairment of memory and he passes simple memory tests satisfactorily. He has improved in his general physical state, but the pupils are now inactive to light. The Wassermann reaction and the Lange and other tests are unaffected by treatment. His mood is distinctly euphoric and the *déjà vu* phenomenon is being worked into a grandiose delusion.

Cases of General Paralysis Treated by Inoculation with the Organism of Relapsing Fever.

By WILLIAM S. DAWSON, M.D.

CASE 1.—Male, aged 44. Symptoms were noticed about two years ago, after an illness diagnosed as influenza, when he became irritable, forgetful and had some difficulty with his speech. The condition lasted only a short while and he worked up to September, 1926. He then became dull, forgetful, very retarded in his actions and confused and incoherent in his statements. When seen at this hospital early in October there were signs of general paralysis, especially small pupils inactive to light, lingual tremors, slurred speech and exaggerated tendon reflexes. Blood and cerebrospinal fluid were strongly positive to Wassermann reaction, and the Lange curve was of the paretic type.

October 10.—Received subcutaneous injection of 1 c.c. blood from a patient with relapsing fever.

October 18-20.—First pyrexial attack, rising to 104° F.

October 26-November 8.—Irregular pyrexia of about 102° with maximum pulse of 120 and respirations of 20 to 26. Patient made no complaint of any discomfort and repeated physical examinations showed no physical signs. Blood cultures were negative and blood count was normal. No spirilla were found on several examinations. Two intravenous injections of 1 grm. tryparsamid had no immediate effect on the pyrexia. The patient became somewhat weak and exhausted, but quickly recovered a few days after the pyrexia had ceased.

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November 15.—Temperature of 101° F. for a day.

November 26.—Temperature of 99° for a day.

Injections of 2 gm. tryparsamid have been given weekly since November 25. He improved mentally up to January 1 when he again became confused and incoherent, and his speech was so slurred as to be unintelligible at times.

CASE II.—Male, aged 52. Gradual change in disposition with deterioration in efficiency for about two years. There were more acute developments in September, 1926, when he became excited and deluded. The pupils still react to light. The tendon reflexes are greatly exaggerated. There are facial and lingual tremors. The Wassermann reaction is strongly positive in the blood and cerebro-spinal fluid, and other typical reactions are given by the latter fluid.

December 9.—Injected with blood from mouse containing spirilla.

December 15.—Temperature of 102-103° F. for two days. No spirilla found in the blood. No special physical signs. Patient felt very comfortable.

December 29.—Temperature 102° F. for a day.

One or two more pyrexial attacks are expected before the relapsing fever dies out naturally. The condition of the patient is so far unchanged.

Two Cases of Dwarfism.

By C. P. G. WAKELEY, F.R.C.S.

B. G., MALE, aged 46, and his wife, aged 42. The male is 3 ft. 2 in. in height, and declares that he is the smallest man in the world. His weight is 3 st. 3 lb. He has recently been a patient in King's College Hospital, as he had sustained a compound comminuted fracture of the right tibia and fibula in a motor accident. He cannot read or write. He does not know the value of money, and is capable of but the simplest thought. He likes looking at picture books. He drinks and smokes a great deal. He is well-proportioned, with a normal growth of hair, and has a deep-toned voice. Blood-pressure 80 and pulse 90. X-ray shows his pituitary fossa to be small. He is a professional conjuror and appears to be fairly successful at this, but is an infant as regards the business side of his profession.

His wife is 3 ft. 3 in. in height, and treats him as a baby. Her mentality is somewhat higher than his, and she manages his business affairs with some degree of efficiency.

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President—Mr. V. WARREN LOW, C.B., F.R.C.S.

The Pathogenesis of Gastric and Duodenal Ulcer with a Consideration of the General Rules of Treatment.

By JOHN M. T. FINNEY, M.D., Baltimore, U.S.A.

THE first description of the pathology of gastric ulcer was published by Matthew Baillie in 1793, but inasmuch as it was not accompanied by any clinical data, it had little effect in stimulating interest in the condition. Abercrombie, in 1824, described much of the symptomatology but did not differentiate simple ulcer from ulcerated carcinoma. The credit of having first recognized the difference between ulcer of the stomach, carcinoma and ordinary gastritis probably belongs to Cruveilhier, who, between 1829 and 1835, published accurate descriptions of the anatomy, the clinical course and the treatment of peptic ulcer. Following Cruveilhier, Rokitsansky, in 1839, described the anatomy of the condition, basing his description on 79 cases. At the time that Dr. William H. Welch wrote his masterly account of "Simple Ulcer of the Stomach" for "Pepper's System of Medicine," published in 1885, he found medical literature abounding in articles upon this disease. Some of the more important contributions were those of Gatch on symptomatology and diagnosis, Virchow on aetiology, the statistical analyses of Brinton, and the articles of Ziemssen, Leube, Budd, Chambers, Habershon, Fenwick and Fox. Of the enormous number of articles published dealing with this condition since 1885, very few have materially advanced our knowledge of the pathology of the condition. The developments made in surgical technique have been the bases for the great amount of work that has been done in the experimental production and treatment of this condition, and have widened greatly the field of surgical activity.

The origin and persistence of gastric ulcer has been the source of much speculation and experiment. Most observers agree that the action of gastric juice plays an important rôle in the development and persistence of ulcer, but there have been many theories advanced as to the initial and predisposing cause. It is apparent that there must be some underlying cause for the origin and persistence of gastric ulcer apart from the contributing effect of the digestive action of the gastric juice. This has been shown experimentally by the fact that when portions of mucosa have been excised, the defects heal rapidly in the absence of this underlying factor (MacCallum). The action of gastric juice alone is insufficient to inaugurate ulceration in normal gastric mucosa, and is equally ineffective in preventing the rapid healing of artificially produced defects, provided the blood-supply is intact. In the present state of knowledge, if one single factor is to be looked upon as the basis for ulcer of the stomach, it must be closely identified with a disturbed blood-supply. By analogy with chronic ulcers elsewhere in the body, this contention is borne out. Even the so-called "trophic" ulcers are usually seen in regions of the body where the blood-supply is relatively poor, such as the lower leg. Ninety-eight per cent. of ulcers of the stomach and duodenum are located in the region of the pylorus, the posterior part of the lesser curvature, the pyloric antrum and the first portion of the duodenum;¹ or with reference to the blood-supply, they are found in that part of the

¹ In the year ending June 30, 1921, there were 622 cases of peptic ulcer of the stomach and duodenum, verified by operation at the Mayo Clinic. Of this number, 500, or 80.3 per cent. were duodenal, and 122, or 19.7 per cent. gastric (W. J. Mayo, "Progress in the Handling of Chronic Peptic Ulcer," *Journ. Amer. Med. Assoc.*, Chicago, 1922, lxxix, p. 19.) Balfour states that "Ulcers of the lesser curvature, including those closely associated with the lesser curvature on the anterior or posterior wall, comprise almost 90 per cent. of all gastric ulcers" (D. C. Balfour, "Surgical Management of Gastric Ulcer," *Ann. of Surg.*, 1921, lxxiv, p. 449.) Of their 122 gastric ulcers, 110, or 90 per cent., were located in a fairly limited portion of the stomach, a portion roughly defined by the right gastric artery. These, combined with 500 duodenal ulcers, make a total of 610, or 98 per cent., of 622 cases of peptic ulcer.

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stomach and duodenum supplied by the right gastric artery and the gastro-duodenal artery with its supraduodenal branch (of Wilkie). There would seem to be some relationship between these two facts. Pursuing the analogy further, one finds a marked relative absence of chronic ulcers of both the stomach and the legs of animals.¹

Two marked differences are evident in this comparison of man and the four-footed animals. One is the upright position of the former, which may be largely responsible for at least one distinctly human abnormality—inguinal hernia.² Another is the fact that in man the duodenum is retroperitoneal and much less mobile than in animals. It is quite plausible that a vascular arrangement which is sufficient to withstand the effects of various predisposing factors in animals, is insufficient to provide a constantly wide margin of safety against identical factors in man.

W. J. Mayo attributes the preponderance of duodenal ulcers in males over females partly to an anatomical reason, and believes this reason to be the fact that the alkaline bile and pancreatic secretion, by reason of the more nearly transverse position in the female, bathes the upper duodenum more constantly.

If we assume that man, because of faulty adaptation of his circulatory apparatus to the upright position, is peculiarly liable to chronic ulcerations in certain parts of the body (the legs and the vicinity of the pylorus), may it not be possible that we may become less interested in the many theories advanced for the initial cause of gastric and duodenal ulcer? This assumption of course may or may not be warranted by the facts.

The initial lesion which ultimately develops into a chronic ulcer doubtless arises from a variety of causes. If the narrow margin of safety in the human subject be once encroached upon by some injury to the mucosa, the digestive and eroding action of the gastric juice is probably sufficient to develop a chronic ulcer. This conception brings post-operative gastro-intestinal ulcers more closely into relationship with peptic ulcer.

With proper technique, segments of intestine may be resected, opened and implanted into the stomach wall. Provided the blood-supply remains intact, the intestinal mucosa survives without ulceration. This indicates that intact living mucosa, other than gastric, resists perfectly the action of digestive juice, and suggests that gastro-jejunal ulcerations may be the result of improper technique, which endangers the blood-supply. By "improper technique" is meant the abuse of clamps in making the anastomosis; the faulty control of bleeding; faulty asepsis; hæmatomata of the suture line; the development of kinks and adhesions, in short, the presence of any factor tending to impair the circulation of a localized area of intestinal wall.

The theories which have been advanced regarding the initial cause of peptic ulcer may be classified according to whether or not the initial lesion is regarded as inflammatory, neurogenic, circulatory, bacterial or digestive. The principles

¹ Truck found no gastric ulcers in 189 healthy and 82 diseased dogs, *Journ. Amer. Med. Assoc.*, 1906, xlv, p. 1753.

Mann found none in 200 normal dogs and cats, *Journ. Exper. Med.*, 1916, xxiii, p. 203.

Ivy found only one acute gastric ulcer in 900 dogs after etherization for laboratory experiment. He noted the great rarity of ulcer in dogs and cats and adds that if gastric juice digestion was a basic factor, we would expect to find more ulcers in dogs than in man, since the dog's acidity is of greater average than man's. He suggests that there may be some factor present in man and absent in the dog, which determines the chronicity of the ulcer, *Arch. Int. Med.*, 1920, xxv, p. 6.

² While it is true that inguinal hernia is not unknown in the dog, it is remarkable that it does not occur more often, since both the tunica vaginalis and the canal of Nuck in this animal remain patent. Hernia in dogs is more common in the female, a fact which Beall attributes to the occurrence of pregnancy (Beall, *Maryland Med. Journ.*, 1905, xlviii, p. 327, J. H. H. Medical Society).

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embodied in these theories have been claimed to act either independently or in combination in producing the acute ulcer and determining its persistence.

THE INFLAMMATORY THEORY.

This was one of the earliest theories advanced. It was advocated by Abercrombie and also by Cruveilhier, who was influenced by the evidence of inflammation elsewhere in the stomach. Various degrees of gastritis are frequently found in conjunction with chronic ulcer, but there is no basis for assuming that it may be the cause rather than the effect of the presence of the ulcer.

THE NEUROGENIC THEORY.

This theory has had several interpretations based upon the effect produced on the different structures and functions of the stomach. A disturbance of the nerve-supply of the stomach has been claimed to account for hypersecretion of gastric juice, hypermotility (spasm) of the musculature, blood-vessel spasm and "trophic states," all of which have been associated by different authors with the condition of chronic ulceration.

The stomach is innervated both by the vagus and by sympathetic fibres from the celiac plexus. These nerves approach the stomach through the gastro-hepatic omentum, and after penetrating the muscular coats, form the myenteric ganglia. Nicolaysen found these ganglia more profuse in the region of the cardia and near the pylorus. In extensive studies of the nerves adjacent to ulcer of the lesser curvature, both Permans and Nicolaysen found a definite and sometimes marked neuritis and perineuritis, and although they believed this condition to be secondary to the ulcer, they agreed in its probable effect on healing and on gastric motility.

As early as 1828, Cammerer had attempted to produce destruction of the stomach wall by resection of the vagus and administration of acetic acid. There have been countless reports of experiments involving either the vagus or splanchnic nerves, many of which are contradictory. Ijzeren, in 1901, showed that after section of the vagus, ulcer was not obtained as usual if a gastro-enterostomy was performed at the same time. Other authors, however, have not consistently observed ulcers following section of the vagus, so these results were not definite, and until the work of Payr (who succeeded in producing chronic ulcers) were inseparable from normal healing. Dalla Vedova found ulcers in 41 per cent. of attempts after experimental destruction of the celiac ganglion, and in 60 per cent. after destruction of the splanchnic nerve. Kobayashi and Kanamura observed multiple erosions of the gastric mucosa not only after pricking or extirpating the celiac ganglion but also after section of the spinal cord or ligation of the vagus nerve.

Rost states that if it can be shown that there is not only a definite constitutional weakness in individuals with ulcers, but an actual predisposition of the vessels in the neighbourhood of the stomach to cramp, a factor of importance will have been discovered. Unfortunately, the information derived from many conflicting results of work along these lines has so far been of little value in its application, either to the pathology or treatment of the condition.

THE CIRCULATORY THEORY.

As a cause of simple ulcer, local circulatory disturbances with arrest or impairment of the circulation in a circumscribed part of the stomach wall have been supported by the work of many experimenters. The scope of most experiments has extended from attempts to interfere with a localized area of the mucosa to efforts directed towards the disturbance of the circulation of the entire stomach, both directly and indirectly. Rokitansky was the first to note hæmorrhagic necrosis of gastric mucosa, and his observation was followed by Virchow's description of

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digestion following hæmorrhagic infiltration induced by local impairment of circulation. Conditions which may affect the circulation of any part of the stomach wall include embolism and thrombosis, diseases of the vessel wall, such as atheroma, endarteritis obliterans, fatty degeneration, amyloid degeneration, miliary aneurysms and varicose dilatations, compression and obstruction by spasm of the muscular coats of the stomach wall and vaso-constriction of neurogenic origin.

In favour of the circulatory origin of chronic ulcer is the fact that parts of the stomach wall from which the circulation has been shut off are subject to digestion. This is confirmed by the production of ulcers experimentally, after injecting into the gastric arteries substances acting as emboli. Also, hæmorrhagic infarctions, the hæmorrhagic infiltration of acute ulcers, and their frequent funnel shape, suggest their circulatory origin.

On the other hand, the infrequency of demonstrable changes in the blood-vessels about an ulcer, the fact that ulcer occurs earlier than the age when arterial disease is usually present, and the absence of ulcer in most cases of heart and arterial disease may be considered as evidence against the circulatory theory.

These objections have been met by the contention that the disturbance of the circulation is an intermittent affair, the anatomical demonstration of which is impossible. The circulatory theory is here closely associated with the neurogenic theory in its explanation of the local anæmia. As stated above, Klebs supports the idea of local spasmodic contraction of gastric arteries, with temporary interruption of the circulation. Orth suggested that compression of the gastric vessels by spasm of the muscular coats of the stomach, occurring in vomiting and gastralgic attacks, may result in hæmorrhagic infiltrations which may develop into ulcers.

Attempts made to interfere directly with the circulation in parts of the stomach wall include procedures affecting the larger vessels and also the capillary distribution. Littauer's observations have been confirmed by Ivy, who ligated six to eight branches of the gastro-epiploic vessels supplying the pyloric portion of the stomach, with negative results. Braun demonstrated that four-fifths of the blood-supply of the stomach may be cut off without necrosis. Fibich was able to produce chronic ulcers by ligating arteries, excising a portion of mucosa followed by cauterization of the base. This procedure, however, in the hands of Clairmont did not produce ulcers. An indirect result of these experiments has been the proof that as far as surgical procedures are concerned, the stomach is a very viable organ.

Cohnheim produced ulcers by injecting lead chromate into the gastric artery, and Payr obtained chronic ulcers by injections of formalin, dermatol, and indian ink. This method of injecting aseptic emboli had been used by Klebs and Welti, and recently by Ivy. Ivy obtained negative results with a bland substance, such as charcoal, and it would seem that Cohnheim's and Payr's work was not illustrative of the effects of purely aseptic emboli, but brought into consideration the actual destruction of tissue. Ulcers may be produced in this manner, which is properly a variety of trauma analogous to Roth's method of injecting 5 per cent. silver nitrate into the mucosa, or even related to Daettwyler's ulcers produced by mechanical, chemical, or thermal irritants applied through a gastric fistula.

The idea that the origin of gastric ulcer depends on diseased conditions of blood-vessels is supported by the findings of a comparatively small group of cases, although changes in the blood-vessels of the stomach have been seen in a considerable number of cases of gastric ulcer (according to Nicolaysen, 75 per cent.), and gastric ulcer has been recorded in association with most of the diseases to which blood-vessels are subject. Examples of embolism of the artery supplying the ulcerated area of the stomach have been published, but many of them are open to criticism.

Thrombosis of the vessels about an ulcer has been observed, and in some cases

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the thrombosis has been prolonged considerable distances beyond the ulcer. Atheromatous changes are not infrequently seen: obliterative endarteritis, already mentioned, is probably secondary, similar to that found near tuberculous cavities in the lung. Miliary aneurysms occurring independently or associated with ulcer have been described. In the majority of cases, however, no changes are found in the blood-vessels of the stomach except those apparently secondary to the ulcer.

Since Virchow attached particular importance to disturbances in the circulation of the stomach in the pathogenesis of ulcer, there is especial interest in the relationship between gastric ulcer and diseases of the heart and blood-vessels. As might be expected, ulcers are found in a small percentage of cases in which blood-vessel changes regularly occur, including atheroma, syphilis, and nephritis. But there are many not so associated, and it will be recalled that the age of onset of gastric ulcer in nearly 70 per cent. of cases is under forty years.

Wilkie demonstrated that the blood-vessels of the first part of the duodenum differ greatly from those of the remainder. The superior portion is dependent on a variable branch of the gastro-duodenal artery, which he designated the supra-duodenal artery. He also called attention to the scant anastomoses of the terminal branches of the vessels in this region. Berlet recently published his results with injections somewhat similar to Wilkie's. He found the profuse anastomoses of the greater portion of the stomach greatly diminished at the pylorus, and that the actual site of these vessels was small. He concluded that this condition predisposed to circulatory disturbances and was less able to establish compensatory anastomoses in the event of disturbances. This anatomical demonstration of a relatively poor blood-supply of this important region of the stomach and duodenum is quite in accord with the idea that the upright position of man plays considerable part in the pathogenesis of ulcer. Krempelhuber states that anæmia of the mucosa can be brought about purely mechanically by the gastropexia, which according to him is present in 88 per cent. of cases of ulcer.

THE BACTERIAL THEORY.

Böttcher early advocated the theory that stomach ulcers were of infectious origin. The rôle of bacteria has been considered twofold: embolic and toxic. The embolic theory leads again to the idea of local circulatory disturbance, while the toxic assumes a specificity against gastric mucosa comparable to the gastro-toxin of Bolton. Many bacteria have been described as the causal agents of ulcer, but for the most part have been considered secondary. Intravenous injections of different bacteria have yielded no constant results. Bolton was convinced that the commonest cause of necrosis of the mucous membrane, resulting in acute ulcer, is bacterial infection through the blood-stream, and that the necrosis was due to direct effect on the tissues of bacterial poison or of bacterial poison combined with the action of gastric juice.

A most significant and interesting work has been that of Rosenow, of the Mayo Clinic, who has shown the selective affinity of streptococci, which are capable of reproducing lesions peculiar to the particular strain. Rosenow's summary of his work in 1916 is as follows:—

"The ulcers produced by the injection of streptococci resemble those of man in location, gross and microscopic appearance and in that they tend to become chronic, perforate or cause a severe or fatal hemorrhage. Streptococci having a characteristic affinity for the stomach and duodenum have been repeatedly isolated from various foci of infection in patients with ulcer and from ulcers themselves. They tend to disappear from the circulation and do not commonly produce marked lesions otherwise. They have been isolated from ulcers in animals and ulcer has again been produced on their re-injection. Filtrates of these cultures have no special tendency to produce ulcer."

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He states in conclusion :—

"The small ulcer of the stomach and of the duodenum in man is primarily due to a localized hæmatogenous infection of the mucous membranes by streptococci."

Rosenow's conclusions have not been unreservedly accepted by bacteriologists. Although streptococci are found present in a large percentage of gastric ulcers, doubt has been expressed that these organisms have been proved to be the factor which either initiates the ulcer or prevents healing. In spite of this, most surgeons have made practical application of the principle that the treatment of gastric ulcer should be reinforced by a thorough search for and elimination of all possible foci of infection elsewhere in the body, a diseased appendix, gall-bladder, etc.

THE DIGESTIVE OR CORROSIVE THEORY.

The importance of the gastric juice in the production and development of ulcers has long held the attention of surgeons. It is now generally believed that gastric juice has little or no part in the initiation of ulceration, but that its digestive action, after injury to the mucosa, is an important contribution toward the persistence of the ulcer. It is, however, probable that these two factors—initial injury and subsequent digestion—if unaccompanied by a continuance of the underlying cause, are insufficient to prevent healing. Without previous injury, the gastric mucosa resists digestion. With ordinary injuries, gastric digestion alone is insufficient to prevent healing. Many attempts have been made to explain this resistance of gastric epithelium. Hunter believed that resistance to digestion is a general property of all living uninjured cells. This would seem to be disproved by the common occurrence of digestion of the skin about a gastrostomy opening. Claude Bernard noted digestion of the thigh of a living frog which was placed in a gastric fistula; and Pavy observed the same effect on a rabbit's ear. Matthes' explanation that the living tissue was killed by hydrochloric acid before digestion took place does not solve the difficulty. Epithelium other than gastric is able to resist this action of hydrochloric acid, which may be properly included in the digestive processes. We have implanted into the stomach wall of dogs, resected and opened loops of small intestines, preserving carefully their viability, and have noted resulting superficial erosions in only a small number. The problem apparently deals not with living uninjured tissue as such, but with the explanation of the protective power of alimentary mucosa against gastric digestion. This resistance has been attributed to the presence of mucin in the mucous secretion of the pyloric antrum and to the presence of a so-called anti-pepsin. However, the theory that the resistance of gastric mucosa against auto-digestion is due to the presence of antipepsin, and that a diminution of this substance in the stomach wall is followed by ulcer, has not been proved.

The multiplicity of methods by which acute ulcers may be experimentally produced has probably tended to clear rather than obscure the problem of pathogenesis. Ivy, whose important work has touched on most aspects of the physiology of the stomach, concluded that acute ulcers may be produced by anything that causes a local necrosis by direct, toxic, or chemical action on mucosal cells, or by interfering with or disturbing the normal condition of the capillaries of the mucosa. He found that erosions were common in cachectic dogs, without regard to the condition bringing about the cachexia, or the method of experiment. This would lessen the value of the observation that ulcers are often found in dogs moribund after adrenalectomy, or after extensive operative manipulations of the stomach. Ivy classified the chief theories as regards the pathogenesis of ulcers as follows :—

(1) Infection and re-infection of the mucous membrane through the blood-stream by specific or non-specific bacteria from a local infection.

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(2) The corrosive action of gastric juice on mucosal cells, that in some way have had their normal resistance against acid-pepsin digestion diminished.

(3) Localized trophic disturbances.

(4) A general condition of autolysis.

The characteristic appearance of stomach ulcers is probably due not to any specific cause, but to the digestive action of the gastric juice, which keeps clean the base and sides of the ulcer. These clean edges and base justify no conclusion as to the cause of the ulcer. Peptic ulcers probably originate from various causes acting upon favourable tissue, i.e., that part of the stomach and duodenum supplied by the right gastric artery and the gastro-duodenal artery, with its supra-duodenal branch. The initial injury is rendered chronic by the continuous erosive action of the gastric juice, which is aided in its effect by adjacent (secondary) neuritis, perineuritis and obliterative endarteritis.

The malignant transformation of ulcers was first suggested by Cruveilhier in 1829. This tendency of gastric ulcers to become cancerous has been commented on repeatedly by pathologists and surgeons since that time. That ulcer of the stomach may be the origin of carcinoma seems definitely established. It is of considerable importance to the surgeon, inasmuch as his treatment of gastric ulcer must be profoundly influenced by his opinion as to the proportion of simple ulcers in which this carcinomatous change may be expected to develop. The surgeon who believes that this proportion is over 50 per cent. will naturally advocate more radical procedures than the surgeon who believes it to be less than 5 per cent.

Cabot and Adie have recently reviewed the trend of opinion on this subject, and have shown the fluctuations of surgical opinion on the estimated percentage. From their article it is found that of eighty-two reports seventy-four authors believe that less than 10 per cent. of gastric ulcers develop carcinoma; while fifteen authors believe the frequency to be over 50 per cent. This wide variation indicates that while the tendency is recognized, the criteria on which opinions are based differ widely. It is of obvious importance that these criteria be so standardized that published reports will have some common basis for comparison. The solution of the problem has been approached by three methods of study:

(1) The comparison of the occurrence of ulcers and carcinoma by the statistical method.

(2) The study of the history of cases of ulcer and carcinoma, with the attempt to differentiate one from the other at some stage. Likewise the study of the life history of ulcer treated conservatively.

(3) The study of the gross and microscopic pathology.

None of the information gained from any of these methods may be considered as of great positive value. The material may unconsciously be used to support a preconceived idea, which would detract immeasurably from a conclusion which is at best inferential. However, if it is found that the frequency of occurrence as estimated from all of these methods regularly falls near a common figure we have valuable evidence which would enable us to discount any unusual figure which would be arrived at by the use of any one method of study.

Williams made extensive use of statistical evidence, and regarded it as incompatible with the frequent origin of cancer from ulcer. His conclusions were based on the sex and age incidence, and the comparison of the location of ulcer and carcinoma.

Clinical evidence has been furnished by many observers, and there are definite examples reported in which carcinoma has been preceded by a long history of ulcer. A very sound objection to inferences drawn from observations such as these is the difficulty not uncommonly encountered of differentiating gastric from duodenal ulcer. Several authors claim that the transition from simple ulcer to carcinoma is marked

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by the change from hyperacidity to anacidity, the appearance of a tumour and cachexia in the course of long observed cases. Lockwood, in 174 cases of gastric carcinoma, found a suggestive history of ulcer in 7 per cent. and a definite history in 3 per cent. Less than 5 per cent. of carcinoma developed in 346 ulcers of the stomach treated by medical measures and observed by Greenough and Joslin and Hemmeter. Joslin later published figures showing that 24 per cent. of the late deaths following operation for gastric and duodenal ulcers were from cancer of the stomach. From studies of the literature Galpern found a small percentage of recurrences in the form of carcinoma, and Gressot places the frequency at 23 per cent. Balfour reports that in 799 cases operated on for gastric ulcer at the Mayo Clinic, 33, or 4.1 per cent. died from cancer during a seven-year period. In 1,610 cases cited by Ewing, the frequency was 2.2 per cent., and this author believes it quite possible that some of these were originally cancer. Ewing states that from clinical evidence it may be concluded that a great number of ulcers have been treated medically for some years without developing cancer; that the number developing cancer after gastro-enterostomy is not appreciably larger than after restriction of the ulcer; that a diagnosis of cancer following ulcer, to be acceptable, should carry with it a previous history of ulcer; that this history covers a period of ten to thirty years in certain well attested cases, while in less satisfactory but possibly genuine cases the history of ulcer covers not more than two years.

The microscopic examination probably accounts for the greatest variation of opinion as to frequency. When the ulcerated primary carcinomas are eliminated, there is left a group of chronic ulcers in the edges of which are changes that have been interpreted by some as inflammatory hyperplasia, by others as carcinoma. Wilson and MacCarty are perhaps the chief modern exponents of the latter contention. On the basis of their studies and their interpretation of cellular pathology they have estimated the proportion of ulcers which develop secondary carcinoma as 68 per cent.; and also, the proportion of carcinomata, which develop from pre-existing ulcer as 71 per cent. Ewing considers that these inflammatory hyperplasias and misplacements may well be considered as pre-cancerous lesions, but that, on the other hand, there is no direct evidence to show that any given pre-cancerous lesion would, if undisturbed, go on to develop cancer. Indeed, Galpern and Bamberger's observations on the fate of gastric ulcer after gastro-enterostomy seem to prove that these lesions seldom go on to produce cancer.

While we think there is no reason to believe that carcinomatous transformation occurs in more than 10, or at the most 15, per cent. of gastric ulcers, there is another more practical phase of the question that is not answered by the academic discussion. The operating surgeon should be able to classify the lesions, which Ewing says readily fall into two groups—simple ulcers and primary ulcerated carcinoma. If the surgeon is unable to differentiate these, which every now and then happens, and in addition believes that over 50 per cent. of the former develop secondary carcinoma, he will be consistently radical in his procedures. On the other hand, the surgeon who is able to differentiate between simple ulcer and ulcerated carcinoma, either from the gross appearance described above, or with the aid of a pathologist with whose opinion he is in accord, and who does not consider local migratory hyperplasia necessarily indicative of cancer, will have little hesitation in treating simple ulcers conservatively.

The problem may present itself according to the proportion of ulcerated lesions that the surgeon is able to differentiate at the operating table. It is our impression, based upon a fairly wide experience with both fresh and laboratory material, that about 85 per cent. of such cases may be recognized without microscopic aid as benign. Of the remaining 15 per cent., on microscopic examination about 5 per

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cent. will be found entirely benign; another 5 per cent. will present recognizable carcinoma; while the remaining 5 per cent. will require a microscopic study of serial sections to ascertain their true character. It is also our experience that here, just as in doubtful tumour of the breast, the more common error is to call a benign condition malignant, rather than a malignant condition benign. This tendency will probably colour the surgeon's opinion with regard to operation.

The surgical treatment of gastric ulcer and carcinoma began in 1881. Following their experiments on dogs, Gussenbauer and von Winiwarter, in 1876, had proposed pylorotomy, and are generally given credit for its introduction, although Jones, of Philadelphia, had anticipated them by a century, and Merrem, of Giessen, by over half a century. But their work attracted little or no attention. Péan, in 1879, and Rydygier, in 1880, had unsuccessfully attempted the operation on human subjects. Billroth, in 1881, successfully removed a pyloric carcinoma, and his procedure of suturing the remaining portion of the stomach to the duodenum end to end, became known as the "Billroth I" method. In 1885, Billroth used gastro-enterostomy to restore continuity following gastric resection, with closure of the cut ends of both stomach and duodenum. This became known as the "Billroth II" method. In von Hacker's article describing this procedure, the suggestion was made of terminal lateral gastro-jejunostomy, which was subsequently first performed by Krönlein. To this operation and the subsequent slight modifications of its principle have been attached from time to time the names of von Hacker, Krönlein, Mikulicz, Eiselsberg, Hofmeister, Reichel and Polya. The principle of their operative procedure may be made to include as wide a resection of the stomach as desired, even to a complete gastrectomy.

A plastic operation on the pylorus was first performed by Heineken in 1886, followed independently by Mikulicz in 1887. Kocher's side-to-end gastro-duodenostomy following pylorotomy was reported in 1891. Lateral gastro-duodenostomy was suggested by Jaboulay in 1892, and the first report of its clinical application was made by Henle in 1898, who states that Mikulicz had suggested the method. This operation was the precursor of the gastro-pyloro-duodenostomy of Finney, with resection of the ulcer, which was reported in 1902 and is now known as "pyloroplasty." Dissatisfied with the disturbed physiology presented by the Billroth II group of anastomoses and by their tendency to cause secondary ulceration, von Haberer, in 1922, and myself, in 1924, working independently, reported experiences with the Billroth I method modified into an end-to-side gastro-duodenostomy.

In Dr. Welch's article of 1885 there are nine pages devoted to the medical treatment of gastric ulcer, with a short paragraph on surgery. At that time it was thought that the treatment was entirely medical, but that cicatrization of the ulcer by no means always cured it in the clinical sense. As a result of adhesions and scar-tissue contraction, serious disturbances of the function of the stomach might follow the repair, the most important of which was stenosis of the pylorus. Dr. Welch found three successful cases in four recorded attempts at extirpation of a stenosing ulcer of the pylorus. He ventured the opinion that the resection of gastric ulcers which resist all other methods of treatment, and especially those which cause progressive stricture of the pylorus, was a justifiable operation. He noted, however, as extravagant and unwarrantable the bold suggestion of Rydygier, who advocated exploration and resection of an ulcer from which hæmorrhage threatened to be fatal.

It is interesting to compare our views to-day, forty-five years after the beginning of gastric surgery, on the subjects which were debatable even at that time. It would appear that the greatest influence had been exerted by the tendency to regard

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every ulcer as a potential carcinoma and a source of grave danger from hæmorrhage, perforation or obstruction. This, combined with the development of diagnosis by means of the X-ray and the establishment of a very characteristic clinical syndrome, has led to the use of surgery in ulcers before the stage of cicatrization has been reached. The idea that the degree of gastric acidity exerts a marked influence on the healing of ulcers has distinguished a group of surgeons who advocate extensive resection of the stomach beyond the ulcer area from those surgeons who are content with more conservative measures. We must confine ourselves to this very sketchy outline of some of the chief considerations underlying the surgical treatment of gastric and duodenal ulcers, as time will not permit of a more extended review.

The operations usually performed for ulcer of the stomach may be considered as being either conservative or radical. The conservative group may be subdivided into the following procedures:—

(1) Procedures directed toward local excision, cauterization, or suture of the ulcer; (2) local excision, etc., plus gastro-enterostomy or pyloroplasty; and (3) gastro-enterostomy or pyloroplasty alone.

An operation may be considered radical when the effort is made to remove not only the ulcer, but also that part of the stomach which has been shown to develop 90 per cent. of ulcers (the so-called ulcer-bearing area of Rodman).

In his choice of operation, the surgeon should first of all be largely influenced by the condition of his patient, which may be profoundly affected by such complications as hæmorrhage or perforation, with resultant shock; these naturally would restrict the extent of surgical intervention. Such local conditions as dense adhesions may also limit the extent of operative procedures. The surgeon, therefore, should be guided by the conditions found in the individual case. If a chronic ulcer is operated upon in a quiescent stage, the limitation imposed by the patient's poor general condition may not be in force. The operative procedure selected will then be determined by the surgeon's opinion regarding the following important considerations: (1) the importance of removal of the ulcer-bearing area of the stomach; (2) the efficacy of the reduction of gastric acidity by a large resection; and (3) the possibility of subsequent carcinomatous transformation.

PRE-OPERATIVE PREPARATION.

Previous to all surgical operations upon the stomach, there should always be a period of preliminary preparation, unless, of course, the operation is in the nature of an emergency. It has been our invariable practice for many years to prepare our patients according to a regular routine. In patients so prepared infection has been reduced to a negligible quantity. We feel very strongly that both the pre- and post-operative care of stomach cases is of the utmost importance. The latter of these is always carried out in conjunction with the family physician, preferably under the supervision of a competent specialist.

We prepare our patients as follows: For several days previous to the operation the patient, if it is not his usual habit, is instructed to brush his teeth thoroughly with an antiseptic tooth-paste and rinse the mouth with a 1 per cent. carbolic acid solution several times a day. For the same length of time he is kept on a sterile diet, i.e., cooked foods, pasteurized or boiled milk, eggs, orange juice, boiled water, etc. If there is gastric stasis present, lavage once or twice a day, depending upon conditions present, should be employed. Repeated observations by various authors, notably Cushing and Livingood, observations which have been abundantly confirmed by us in cultures taken from both stomach and duodenum while on the operating table, have convinced us that the acid stomach will sterilize itself in approximately forty-eight hours, if no infectious material is meanwhile ingested. However, this

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rule does not apply in case of ulcerating carcinoma of the stomach walls. In the latter condition we have recovered various forms of bacteria, especially the *Streptococcus pyogenes*, a fairly constant inhabitant of the stomach under these circumstances. So far efforts to sterilize the gastro-intestinal tract by means of drugs have proved futile.

The routine comprehensive physical examination of the patient demanded by good surgery should never be omitted, except in case of dire emergency. Starved, dehydrated and exsanguinated patients should be given the benefit of the therapeutic measures indicated in the individual case. Fluids should be forced on the patient, and if the gastric condition limits the amount which can be given by mouth, we rely upon hypodermoclysis and proctoclysis. Transfusions are given when the percentage of hæmoglobin is under sixty.

In the choice of anæsthetic due consideration should be given to the claims of local as against general methods. More and more is it becoming evident that when properly used, regional nerve block, combined with either anterior or posterior splanchnic block, yields excellent results. The administration of a general anæsthetic should always be in the hands of the most competent anæsthetist available. The fundamental rules of good surgery, meticulous attention to details, complete asepsis, gentle handling of tissues, absolute hæmostasis, and the avoidance of undue haste, should invariably govern the surgeon's every action. These general surgical considerations, when scrupulously observed, favourably influence, to a marked degree, the ultimate result. With the purely technical questions involved in the various operative procedures at the surgeon's disposal, we are not now concerned, but rather with the discussion of the principle upon which is based his choice of operation. The factors of chief importance that should influence him in making his choice are, the condition of the patient; the nature and location of the pathological process present; the immediate mortality rate and comparative ease of performance of the type of operation proposed; the ultimate functional result expressed in terms of physiology, personal comfort and efficiency on the part of the patient and the personal equation of the operating surgeon. Every surgeon has his favourite operation and consequently suffers from the temptation to make use of it upon all occasions. In so doing he but courts disaster, for it is bad judgment, and worse surgery, to push any operative procedure beyond its natural limitations. The one question that every surgeon should ask himself when deciding upon an operation, is, "What is the particular operation that offers the best result in this particular case?" A difficult question to answer at times, and one that requires the exercise of that faculty, the *sine qua non* of all good surgery, namely, surgical judgment.

To summarize:—Since the cause of ulcer is unknown and since its presence is an undoubted menace to the comfort and happiness, as well as to the life of the individual who has it, through its potentiality towards perforation, hæmorrhage and malignant degeneration, it would appear that resection of the ulcer, where practicable, would be indicated, in case it has failed to yield to properly carried out medical treatment. I want to pause here a moment in order to emphasize the point that no surgical procedure of any kind should be performed on the stomach without previous consultation with a competent physician. Personally, I never operate upon such cases without such a consultation. This resection of the ulcer, of course, is no guarantee that it may not recur, but as a matter of fact recurrence very seldom takes place. It would appear also that that form of surgical procedure which least disturbs the normal physiological relationship of the stomach with the intestine, other things being equal, would be the method of choice. Starting, then, with these two general propositions, pyloroplasty or gastro-duodenostomy, associated where possible with resection of the ulcer, would appear to

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be the method of choice. The particular mode of accomplishing this would be determined by the conditions present at operation.

The acceptance of these general propositions would relegate to second or third choice the operation of gastro-enterostomy and that of extensive gastric resection. I am quite aware that this position is not that held by the majority of abdominal surgeons, but our own experience with all types of operations upon the stomach and duodenum has convinced us that, in our hands at least, the best results, both immediate and late, are secured by the use of this type of operation. Unfortunately, because of inability satisfactorily to mobilize the duodenum, or for any other reason, pyloroplasty is not always practicable. In such cases gastro-enterostomy may be indicated, but as an operation of necessity, never of choice. Where, for any reason, more or less extensive resection of the pyloric portion of the stomach is indicated, gastro-duodenostomy by the Haberer-Finney method, i.e., end-to-side anastomosis, where practicable, is the operation of choice. Extensive resection of the stomach is reserved almost exclusively for malignant disease, or indurated ulcer in which beginning malignancy is suspected. We are not convinced that the sacrifice of large portions of the stomach wall, vital structure that it is, and interfering as it does with both motor and secretory functions of the stomach, is either indicated or justifiable as a routine procedure for simple ulcer. While in the hands of certain surgeons of skill and experience, the results reported have been gratifying, still, as performed by the average surgeon, the risks of such radical procedures would appear to contra-indicate their general use. In the presence of malignant disease, when operation is indicated at all, i.e., when the disease has not progressed too far, the most radical procedure possible is the most conservative, and is the rule governing the practice of the best informed surgeon. The same rule however, does not govern in the case of benign conditions. Here the reverse is quite true. The reckless sacrifice of important tissues, just as the unnecessary operation, are alike a reproach to good surgery and should be carefully avoided.

Discussion.—Sir JAMES BERRY (President of the Society) said that he had, personally, received so much kindness at the hands of American surgeons when he visited their great country that it afforded him, always, very great pleasure to welcome an American surgeon to this country and to thank him for the trouble he had taken in giving the Society his learned and excellent paper. The pleasure was the greater since he knew Dr. Finney personally, and he had as great an admiration for his work as for Dr. Finney himself.

Sir GEORGE MAKINS: I have no desire to take part in the discussion, but in common with all of us in this room, I am grateful to Dr. Finney for the lucid exposition he has given of the pathogenesis of these diseases, and the judicial attitude he has adopted with regard to the various theories he has quoted. Beyond that, I should like to say, as an old surgeon, that I am glad to hear the theory supported that the surgeon should act, as a rule, in conjunction with his medical colleague. It was an old rule, but it more or less fell into abeyance, and I am glad to know that at the present time it is again gathering strength.

Dr. LEON JONA said he would bring forward a point concerning the pathogenesis of duodenal ulcer. About eleven years ago he did some work on the subject, and it was published in the medical journals of Australia in 1917 and 1918, but the communications might not have been read by those present. He found that if he tied the main pancreatic ducts in dogs, in every case duodenal ulcers resulted—an interesting point, as the lecturer to-night said that duodenal ulcers were rarely found in the normal healthy dog. He therefore concluded that one of the points in the pathogenesis of gastro-duodenal ulcer was, not hyperacidity, but absence, or at least diminution, of the normal pancreatic juice. Of course, secretin stimulated succus entericus, also bile. And the sites where these ulcers occurred were those at which, if the pancreatic juice were absent, there would be a greater acidity. In the upper parts of the stomach the saliva neutralized the acid. In the antrum pylori and the first part of the duodenum there was a minimal amount of pancreatic juice normally, only the quantity that regurgitated in man, the dog, and some other animals.

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The exciting cause of the ulcers was trauma, and in his experiments, if he kinked the duodenum, an ulcer resulted at the kink; but he suggested that the predisposing cause was something interfering with the normal flow of pancreatic juice.

Mr. E. R. FLINT (Leeds) said he confirmed what Professor Finney said as to the superiority of gastro-duodenostomy over gastro-enterostomy. He had operated on nearly 200 of these cases; in only nine of that series had he failed to mobilize the duodenum, and that had not meant any undue traumatism. The nine cases included four in which adhesions were so marked that he thought it advisable not to disturb them, two in which the second part of the duodenum was entirely surrounded by pancreas, two in which the gall-bladder also had to be removed, as he was afraid of adhesions forming between the bed of the gall-bladder and the line of anastomosis. That, however, proved not to have been a reasonable supposition, as since then he had done mobilization in two cases and there had been no trouble at all. His ninth case was that of a boy, aged 12; there was an enormous mass round the duodenal ulcer, and he thought it would be well to leave it alone and do gastro-enterostomy. With those exceptions he had experienced no difficulty in mobilizing the duodenum.

He differed somewhat from Professor Finney as to technique, as he (the speaker) made his anastomosis in the second part, and entirely destroyed the ulcer with the cautery, infolded it, and did anastomosis between the second and third parts, particularly loosening the lower part of the duodenum. In his experience, at the upper end there were many vessels, which made it very difficult to mobilize the first part of the duodenum. The result was very much the same; the gastric contents were delivered into the duodenum, i.e., where they should be delivered. He did not use a clamp on the duodenum, neither did he excise the mucosa. Also, as far as possible, he avoided taking gastric mucosa in with the inner stitch. The clamp was loosened before inserting the inner stitch. No anastomotic ulcer had followed the operation for primary duodenal ulcer, but there had been one in a case in which the operation was done for a jejunal ulcer. In that case he removed the jejunal ulcer, sutured the stomach and intestine, then did a gastro-duodenostomy. Some months later that was followed by an anastomotic ulcer, as proved at a subsequent operation. He would be interested to know what was Professor Finney's experience in that matter. The mortality of that operation was about the same as that of gastro-enterostomy, namely, about 1 per cent., but the outlook after gastro-duodenostomy was much better than after gastro-enterostomy. In both cases the ulcer healed, but patients upon whom the latter operation had been carried out experienced a certain amount of disturbance afterwards, periodically, due, he considered, to the stomach contents being delivered into a part of the intestine which was not accustomed to receive them normally direct from the stomach. He had afterwards kept in touch with as many patients as possible, and in only three cases was there complaint afterwards; they were suffering from constipation, flatulence and vague "indigestion," symptoms which were, he believed, cured on a return to the normal bowel function.

The treatment of gastric ulcers set out by Dr. Finney would probably become the operation of choice in process of time. His (the speaker's) inclination had been to remove a great part of the stomach. He had had 150 of these cases, and the results had been very satisfactory, but still he had always thought subsequently that the operation was not very satisfactory from the point of view of physiology. Physiological principles should, he contended, enter largely into the scheme of all operations. In one case—not his own—he had seen an ulcer appear at the line of anastomosis after an extensive gastrectomy. Ulcers were often so adherent that it was impossible to do anything but gastrectomy, but in many cases, he thought, more gastrectomy was being done than was justified. He had had most of the cases of gastrectomy examined under the microscope, and in only 11 per cent. had there been found any carcinomatous change.

Mr. F. A. G. JEANS (Liverpool) said he agreed with the physiology of Professor Finney's procedure, and that the surgeon should "play to the score" in deciding whether he should do a very large operation, or a conservative one. He (the speaker) wished to put in a slight claim for conservatism in regard to doing partial gastrectomy. When his colleague, Mr. Thurstan Holland, published the first series of skiagrams of hour-glass stomach in this country, there were only two malignant cases out of thirty-six, and yet in all those cases there was a fifteen years' history. The series showed that chronic ulcer, however long persisting, was not very likely to lead to malignant disease. Whatever operation was done,

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whether big or conservative, one would always come across an unfortunate class—the patients—usually men—who were inveterate “ulcerators” and persistent “perforators.”

Mr. R. P. ROWLANDS said that surgeons owed Professor Finney a deep debt of gratitude for having thrown light on this very difficult subject.

His first comment related to causation. He believed that obstruction of the duodenum was an important cause. Duodenal ileus might be an important contributing cause of gastric and duodenal ulcer, but that applied only in a few cases. He was glad to hear Dr. Finney express his conservative attitude, because at the present time, in this country and more so on the Continent, there was a wave of enthusiasm for doing what he regarded as too much. He never could see the advantage of performing partial gastrectomy for simple ulcer. To do that was “burning one’s boats,” for what would the surgeon do if the condition persisted afterwards? Moreover, the mortality from it was seven times as high as that of other operations which, in the end, were more satisfactory.

He had been a very great believer in Professor Finney’s own operation for many years, and he could endorse every word that had been said about it. He had never seen any proved ulcer in the duodenum following its performance. He had had a case in which such was suspected, but the patient did not come to another operation, as he had very septic teeth, and when these had been extracted he recovered under medical attention. He was a persistent “perforator.” He (Mr. Rowlands) had watched him for fifteen years, and the result in this patient did great credit to the method. The result of the gastro-duodenostomy had proved so much better than after the anterior gastro-jejunostomy, which had been the original operation performed on him some years ago for duodenal ulcer by a distinguished surgeon. A jejunal ulcer had formed and perforated; six months later the ulcer had been excised, the gastro-jejunostomy undone, and the opening in the front of the stomach joined to the duodenum. He (Mr. Rowlands) held that the surgeon should not operate on the stomach or on the duodenum, or, indeed, on any other part, unless he could see, or feel, or see and feel, a definite lesion. If that rule were followed there would be fewer poor results to regret.

It had been a pleasure to hear Professor Finney dwell so strongly on the importance of adequately preparing patients before operation in every possible way. He (Mr. Rowlands) was also grateful for what he had said about post-operative treatment, and the incalculable value of active co-operation between surgeon and physician in the after-treatment, as the latter was, in these cases, important and often difficult.

Mr. A. J. WALTON said he appreciated Dr. Finney’s teaching that operations for stomach lesions should be as small as it was possible to make them in order to bring about a cure. He also had viewed with considerable apprehension the recent movement, especially on the Continent, towards the performance of enormous partial gastrectomies. They were not only wrong and dangerous, but also unnecessary.

With regard to pathology, his experience led him to oppose all the theories advanced to account for the formation of ulcers, except one. Stress could not be laid on the anatomical changes of the body and the predisposition to the formation of ulcer, because a striking fact which emerged was that the condition attacked some of the finest-built men. He knew the figures which Balfour had published, showing that when a man having a duodenal ulcer was cured of it, he had subsequently a longer expectation of life than the ordinary person, because he was a selected individual—the sufferers from gastro-duodenal ulcers being strong healthy people. If man had a peculiar type of anatomy in comparison with animals,—and this was the cause of the ulcers,—one would expect ulcers in all types of man. It was in fact a disease not peculiarly of man, but of civilized man.

His experience had not been exactly in accord with that of other surgeons. Up to last June he had had 317 cases of ulcer of the lesser curvature, including hour-glass stomach, 305 cases of ulcer of duodenum, 165 classified as pyloric ulcers. Those figures excluded any question of anatomical peculiarity in the duodenum. He was aware that some surgeons produced figures which did not agree with these. What his experience showed him was that the cause of ulceration was the degree of hyper-acidity. Gastro-jejunal ulcer was limited to men—who had a higher acidity than women, and it only followed pyloric and duodenal ulcers. In these people there was a higher acidity than normal. Dr. Hurst showed that hyperacidity was probably in the nature of a congenital malformation, and he (the speaker) regarded that as a very important factor. There was, he thought, a type of

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active, muscular, energetic man who tended to have hyperacidity. Another factor, in his view, was the modern habit of cigarette smoking, which definitely increased hyperacidity. No doubt it would prove very difficult to break the public of this prevalent habit, as they would probably prefer their ulcer to giving up cigarette smoking.

Another point was that the small frequency of carcinomatous degeneration did not warrant the performance of large gastrectomies on the chance that such degeneration might occur in a given case.

His view was that there was no universal operation for the conditions under discussion, but he thought that as a rule, for the type of ulceration on the lesser curve, local or caudal resection was sufficient combined with measures to neutralize the hyperacidity. Many had tried simple resection alone, but this was followed by a high recurrence rate, and it was desirable to combine it with a temporary pyloric occlusion, which he always performed.

For hour-glass stomach he did a wide-wedge resection; when that did not prove to be possible he did a partial gastrectomy. For duodenal ulcer he still performed posterior gastro-enterostomy. Under that operation the mortality should be the minimum. There was always an accidental mortality; whatever one did, a certain proportion of the patients would succumb to pneumonia, or a pulmonary embolus would arise, but the mortality for operations as a whole should not exceed 1 per cent. The mortality for gastro-enterostomy for duodenal ulcer had been brought down to that level. An objection which had been raised was the possibility of gastro-jejunal ulceration. There had been a great variation in the figures recorded in that respect, but in the figures he had quoted, concerning 783 ulcers, there were 1.5 per cent. gastro-jejunal ulcers, in gastro-enterostomy alone 1.7 per cent. and taking pyloric and duodenal ulcers alone, 2.4 per cent. To replace an operation of about 1 per cent. mortality by one giving 15 per cent. would be absurd. He had followed up 277 cases of pyloric and duodenal ulcer; eleven cases had been lost, and 95 per cent. of the remainder had been well since, and that meant that the patients were now able to do anything and to eat anything. In fact this was one of the most satisfactory conditions for treatment by modern surgery. With regard to the possibility of gastro-jejunal ulcer following partial gastrectomy, he had had to operate on two cases which had been treated elsewhere, because of the subsequent symptoms.

He had not done Dr. Finney's operation, except in two or three cases, largely because he thought that a higher anastomosis gave a more complete neutralization of the acidity. He believed that was the most important factor, but he hoped to carry out the operation more in the future.

Mr. HERBERT PATERSON desired to thank Professor Finney for his admirable paper and for the privilege he had had in witnessing that surgeon's work. Ever since then he had been sitting at the Professor's feet. He would refer to only one point in the paper, the relation of gastric carcinoma to gastric ulcer. He gathered that Professor Finney believed that 5 per cent. of gastric ulcers became carcinomatous. He (the speaker) never disagreed with the Professor, and would not do so now, but he felt bound to say that he did not think that there was a shadow of evidence that any number, even 5 per cent., of ulcers ever became carcinoma. If it were the case that even 5 per cent. became so, then it followed that often we must perform gastro-jejunostomy for ulcers which we believed to be innocent but which were really malignant. Therefore, many of these patients should die subsequently from cancer. We knew this was not the case. Under 2 per cent. were reported as dying subsequently from cancer, and the evidence of cancer in many of this number was doubtful. He would like to ask Professor Finney this question: Why was it that more patients did not die from gastric cancer after gastro-jejunostomy for supposed simple ulcer?

He would suggest two answers and ask him to choose one of them as his own. Patients rarely died after gastro-jejunostomy for supposed simple ulcer (1) because either gastric ulcers did not become carcinomata, or (2) because gastro-jejunostomy cured cancer! There was no alternative answer possible. Whichever answer was accepted, the routine performance of partial gastrectomy for simple ulcer was unjustifiable.

Professor FINNEY (in reply) said he was far from being an enthusiast; he did not perform pyloroplasty every time he opened an abdomen to go to the stomach, but his experience had led him to believe that where it was feasible and practicable it was best. In about 85 per cent. of cases of stomach ulcer he was able to perform pyloroplasty with satisfaction. So that

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there were 15 per cent. cases in which he found it was doubtful whether or not he could satisfactorily mobilize the duodenum so as to bring it out easily, without tension—a very important thing to avoid—and then, even if he had already partly mobilized it, he abandoned the procedure and did a gastro-enterostomy. In indurated ulcer he carried out a wide resection.

In answer to Mr. Paterson, he had no absolute evidence. He had operated on a number of cases and had resected where he thought it was cancer, and yet the most careful examination by the pathologist—who was all the time anxious to score off the surgeon—failed to reveal any evidence of cancer. But he had known a case he had operated upon and found ulcer; cancer subsequently developed. He admitted that of the cases which could be considered to have become cancerous 5 per cent. was the limit; Ewing, a most able man, placed it at 2·3 per cent., and said that a number even of these ought not to be included. He had not heard Dr. Welch express himself on the subject recently; he was always guarded in his statements. Some years ago he heard Welch say a percentage were malignant, but he (Dr. Welch) added that what was the percentage was not known.

It seemed to him that surgery demanded, in the first place, as good, as absolute a diagnosis as was possible; towards that there should be a co-operation between the skiagraphist, a physician of the front rank, and the various tests available. Still, he could not always be sure of his diagnosis, even when the abdomen had been opened, and then it was embarrassing. In that case one had to do the best one could. If there was no demonstrable, palpable lesion, he did nothing. If an ulcer was present, the problem was, which procedure offered the best result? Sometimes it was pyloroplasty. He admitted his own prejudice, but he tried to exercise it. He favoured pyloroplasty because it gave him the best results, and he had never had recurrent ulcer after it. He had had two cases in which he tried to excise the ulcer at the operation, but he made a note at the time that in neither case was he able to satisfy himself that he had removed the whole ulcer; they were cases low down, on the back side. The patients had recurring symptoms. Gastro-enterostomy gave satisfactory results in their case. If thorough excision was possible, one could be reasonably sure that there would be no unfavourable results.

He thanked Dr. Jona for his suggestion; he thought there was something in it; when he had returned home he would try to follow up the point.

[January 5, 1927.]

DISCUSSION ON ABDOMINAL TUBERCULOSIS.

MR. H. W. CARSON.

ABDOMINAL tuberculosis, as seen by the surgeon, does not present many varieties of disease, but each disorder shows variations in symptomatology which may render diagnosis difficult, and the conditions found at operation may make the greatest demands upon one's experience and skill.

For the purposes of this discussion I have investigated all my cases for the last eight years. I find that I have operated during this period upon only five cases of tuberculous peritonitis, four cases of tuberculous enteritis, three cases of ileo-cæcal tuberculosis, one case of tuberculous appendicitis, and fifty-two cases of mesenteric gland tuberculosis, a total of sixty-five cases. But small as this number seems, the field of abdominal tuberculosis is well covered and a great variety of treatment has been necessary. Some of these operations may be classed under the head of "rescue work," that is, that operation has been performed to meet some pressing emergency, generally intestinal obstruction. Six cases were operated upon after a diagnostic error (two cases diagnosed as relapsing appendicitis proved to have miliary tuberculosis, two cases diagnosed as gastric ulcer—one having hæmatemesia as a symptom, the other melæna,—proved to be unusual cases of mesenteric gland

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tuberculosis, as did one case giving a typical history, extending over eight years, of duodenal ulcer. The sixth was the case of tuberculous appendicitis the diagnosis of which was made in the pathological laboratory after removal).

The age of these patients does not bear out the suggestion that abdominal tuberculosis is a disease of childhood. In mesenteric gland tuberculosis, which gives the earliest incidence (though the majority—65 per cent.—have occurred between 5 to 15), there have been nine, or 17 per cent., over 25, two of whom have been respectively aged 50 and 51. Tuberculous enteritis, including ileo-cæcal tuberculosis, has been a disease of middle age, as, except for one child, the other six patients have averaged 38 years, the youngest 23 and the oldest 56.

The association with pulmonary tuberculosis has varied very much. It is quite unusual to find this association in mesenteric gland tuberculosis, though later on two patients developed it, nor is it usual in tuberculous peritonitis, but in tuberculous enteritis the two conditions often occur together, and of my cases of ileo-cæcal tuberculosis one patient died from her lung condition seventeen months after operation.

TUBERCULOUS PERITONITIS.

The origin of this condition is uncertain. Is it ever primary? That is, can it derive directly from the intestine, or is it a blood-borne infection from some distant focus, pulmonary or mediastinal, tubal or mesenteric?

It is usual to describe three forms—(1) the ascitic, (2) the adhesive, and (3) the caseous. I suggest for your consideration that the caseous variety has an entirely different ætiology from the ascitic and adhesive varieties. The caseous is, I maintain, only a late stage of mesenteric gland tuberculosis, and arises from extravasation of caseous material from glandular masses. It is therefore only, if one may say so, an accidental form of peritonitis.

With regard to the other forms, I believe there is a stage before the ascitic, namely the "miliary" type (if that is the word to use), in which the peritoneum is invaded over a greater or less area with minute nodules. This may occur without the appearance of any fluid and the parts chiefly affected are the omentum and the pelvic peritoneum.

The ascitic form, which sometimes occurs as an acute condition, is never seen, I believe, unless miliary tuberculosis is present, so that it seems reasonable to assume that the miliary is the first and the ascitic the second stage. The next type, the adhesive, is, I suggest, a further stage, and is a stage of repair. The fluid is being absorbed and a fibrinization is taking place with a disappearance of the miliary tubercles and the formation of adhesions. If one agrees with this view it gives a definite limit to the scope of operative treatment.

Miliary peritonitis cannot be diagnosed in the absence of fluid and it is generally discovered in the course of an operation undertaken for the relief of abdominal pain, ascribed to the appendix in all probability. The discovery of the condition gives the opportunity of instituting correct treatment at an early stage, and as these cases almost invariably do well the operation is justified.

Operation for ascites is legitimate and has proved successful over and over again. It was first done, they say, by Spencer Wells, who operated with success on a faulty diagnosis. The method of cure is still disputed. It used to be thought that the laparotomy allowed of the escape of fluid of a low or no bactericidal power and that it was followed by peritoneal hyperæmia and the effusion of a fluid of high bactericidal power. I do not know whether this view is still held, and I do not think we have yet agreed as to whether the peritoneum heals up immediately or only after the formation of adhesions, that is to say, whether the operation is curative or only hastens the next stage, that is, the adhesive. I think we all agree that operation in

the ascitic stage is justified and that a cure is obtained without risk and very much more quickly than can be achieved by any other method.

The next stage, the adhesive, if it is a stage of repair, is not likely to be improved by laparotomy. There is a risk even in opening the abdomen, as the intestine is sometimes adherent to the parietal peritoneum and easily injured. Handling the intestine and disturbing adhesions may cause a faecal fistula. Unless obstruction is actually present these cases are better not operated upon; our rule should be to regard operation not as a means of curing the condition but solely as a remedy in emergencies. My experience is that many of these cases do very well if they are left alone, and I am told that great improvement follows treatment with artificial sunlight. This is what one might expect if the condition is really one of commencing cure.

An interesting case in my series illustrated this point. A woman, aged 41, was admitted to hospital with one month's history of umbilical pain and vomiting. She presented the typical ladder type of distension. At the operation there was no fluid, but there were generalized adhesions without any obvious angulation or kinking. I closed the abdomen without doing anything. She recovered and is now quite well, but it took six years to complete the cure.

Most of the operative fatalities occur in this stage, as laparotomy is demanded for obstruction, and as the chance even of finding the seat of obstruction is a slender one, the appropriate remedy may be very difficult to apply.

An interesting point for discussion is whether the adhesions clear up as speedily as do the adhesions following septic peritonitis. I shall be glad to hear the experiences of those who have had the opportunity of opening the abdomen after the cure of peritoneal tuberculosis.

TUBERCULOUS ENTERITIS.

No very new ideas are suggested by the investigation of my few cases, except that only one of the four cases is that of a child. The other three occur in patients aged 44, 27 and 56. In all the cases the ulceration was multiple and in two cases obstruction had supervened. The suggestion that ulceration occurs in patients already suffering from pulmonary tuberculosis who swallow their sputum has support, as two were suffering from active tuberculosis of the lungs at the time of operation. The prognosis is poor, and in my cases one patient died of exhaustion three weeks after resection, one recovered as far as the abdominal condition was concerned, but is still suffering (six years later) from pulmonary tuberculosis, one still has occasional abdominal pain, and only one is free from trouble.

Of the more specialized form of tuberculous enteritis known as *ileo-caecal tuberculosis*, my three cases are all those of adults, aged 27, 23 and 51, and all were of the hyperplastic form. They presented no difficulty in diagnosis and all did well after a block resection of the affected area. One of them, however, died seventeen months later from pulmonary tuberculosis.

Very little has been added to our knowledge of this disease during the last twenty years. In December, 1906, Dr. Henri Hartmann, of Paris, read a paper before the Medical Society of London, which gave so complete an account of ileo-caecal tuberculosis that nothing was left to add or subtract from it. In only one particular has any advance been made since that time, and that is in the X-ray diagnosis after a barium enema. It is unnecessary, therefore, for me to give any description of this type of tuberculous enteritis, a full account of which can be found in *Transactions of the Medical Society of London*, 1907, vol. xxx, p. 334. My experience has been confined entirely to the hyperplastic type (of which I have had six cases), the only case in which I diagnosed the entero-peritoneal variation not being confirmed by the pathologist. I have always understood that the entero-peritoneal type presents

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great difficulties which are not found in the hyperplastic, so I have been unfortunate or fortunate, according to the point of view taken.

TUBERCULOUS APPENDICITIS.

My single case was of the hyperplastic type, and was not recognized as such until it had been microscopically examined. I think these cases are rare, though it is said to be present in 2 per cent. of all removed appendices which have been microscopically examined. Of course, one sees from time to time appendices studded over with miliary tubercles as part of a peritoneal tuberculosis, but these are not cases of tuberculous disease of the appendix. Of the two types, the *hyperplastic*, where there is thickening of the appendix due to connective tissue proliferation, chiefly in the muscular coat, and the *ulcerative*, in which the mucosa is ulcerated without thickening of the other coats, the latter is the more common.

Removal of these appendices has sometimes been followed by the appearance of an ileo-cæcal tuberculosis which was probably present at the time of the appendicectomy. My patient made a good recovery as far as his abdomen was concerned, but is still attending at a chest hospital for some pulmonary condition.

TUBERCULOUS GLANDS IN THE MESENTERY.

We now have to consider the type in which tubercle affects the mesenteric glands. It was really, I believe, in order that I might re-state the position with regard to this condition, which I first elaborated in a paper read before the Medical Society of London in 1918,¹ that I was asked to open this discussion. Since reading that paper I have had fifty-two more cases, and in order that you may compare my findings in this series with my earlier series of fifty cases I have distributed some reprints of my original paper for reference. It is remarkable to see how closely the two series correspond in their general features. I remember that when I stated that the condition could be diagnosed with moderate certainty, even though the glands were not palpable, by the history and the peculiar character of the pain, my audience were not at all convinced, as shown by the records in the Medical Society's *Transactions*. Practically I was told that I could not diagnose the condition and that if I could I ought not to operate for it. But I believe my view is now accepted, and the number of papers published since, mostly in America, bear eloquent testimony to the general agreement of other observers. The cause of the characteristic pain is still occasionally disputed, but I am convinced that my original view is correct and that the pain is due to a spasm of the circular muscle coat. I was rather "heckled" on my opinion that a rise of temperature is unusual, but I have seen no reason on further experience to change my belief that uncomplicated tuberculous glands in the mesentery do not cause a rise in temperature. Of course, if there is a complication that is a different matter, but sepsis is quite unusual, and in the absence of sepsis pyrexia should not occur. Once more one sees that this is not a disease limited to the early years. The average age in my fifty-two cases was 13·9 years, the youngest patient being 1½ and oldest 51. The decade 5 to 15 years is, as before, the most commonly affected period (34, or 65 per cent.), but eleven patients were over 20, of whom two were 50 and 51. The cases are divided fairly evenly between the sexes, twenty-nine males and twenty-three females. The only symptom which is at all common, except for the characteristic pain, is vomiting. This has occurred in exactly half the cases in this series, and if it occurs it always comes with the pain. The mothers often say that the children do not care to play games, because it brings on the pain, but, generally speaking, the children are well nourished (only two reported definite loss of weight) and are not markedly anæmic.

¹ *Trans. Med. Soc. Lond.*, 1918, xli, 220.

DIFFERENTIAL DIAGNOSIS.

Colicky pains in children are so common that it is necessary to be on our guard lest a mistake in diagnosis is made. The most likely disorders to be confused with mesenteric gland tuberculosis are colic from dietetic indiscretions, relapsing appendicitis, intestinal worms and ureteric stone.

(a) *Colic* is distinguished by the infrequent attacks and by the relief obtained by vomiting and by opening the bowels.

(b) *Relapsing appendicitis* is marked by the patient being more ill, the tongue being furred, temperature and pulse-rate raised; there is flatulence, nausea and constipation. The attack of pain lasts longer and is more localized, and there may be tenderness and rigidity on examination.

(c) *Worms* give rise to a variety of symptoms and the diagnosis can be made with certainty only by finding them in the stools.

(d) *Ureteric stone* may easily simulate a calcareous mesenteric gland, but the diagnosis can of course be made by the X-rays with certainty if a ureteric bougie can be passed, and even if it cannot the shape of the shadow is quite distinguishable from the calcareous gland; then there may be urinary symptoms to help.

In not a single case was there pulmonary tuberculosis at the time of operation, but of the non-caseating cases two patients became affected later, of whom one has died.

COMPLICATIONS.

These affect certain types. Thus, intussusception occurred only in the non-caseating type, obstruction only in the caseating. In one caseating case the patient gave a typical duodenal history, in one calcareous case there was hæmatemesis, in one there was melæna, and in one a calcareous gland caused pressure on the cystic duct with consequent distension of the gall-bladder with mucus. The hæmatemesis symptom was not easy to explain.

In the hæmatemesis case, that of a woman aged 41, a large calcareous gland was situated in the mesentery of the jejunum, close to the duodeno-jejunal flexure and adherent to the transverse colon; the melæna case occurred in a man aged 50 with a twenty-five years' history of indigestion, and of melæna at intervals for six months; the omentum was adherent to a calcareous gland in the ileo-cæcal mesentery so tightly that the pylorus was displaced downwards and fixed. Both these patients recovered completely after removal of the gland. Intussusception has occurred in three cases; in one of these there was intussusception three times in six months: when the third laparotomy was performed it was interesting to see how much the glandular infection had retrogressed, probably as the result of artificial sunlight treatment. In eight cases the patient required a more or less complicated operation. Three of these patients were non-caseating cases and suffered from intussusception. One patient who had suffered obstruction for seven days died. The other five were all caseating. In one case there was an adherent Meckel's diverticulum which presented no difficulty, but the other four were all cases of obstruction; one patient recovered after a lateral anastomosis but the other three, in whom resection was done, died. The only case of the late stage of mesenteric gland tuberculosis in this series occurred in a boy aged 1½. He had been suffering from obstruction for three weeks and there was an umbilical fistula and widespread extravasation of feces in the abdomen. He lived for three weeks after laparotomy, but there was never any real chance for him.

The subsequent history is interesting: of the nineteen non-caseating cases in which there was recovery, ten of the patients are quite well, two have occasional pain, one is in poor health with pulmonary tuberculosis, one died from pulmonary tuberculosis and five are untraced. Of the eighteen cases that survived, in which caseation was present, thirteen patients are quite well, two have occasional pain and three are untraced. Of the ten calcareous cases which survived, five patients are quite well, one has occasional pain, and four are untraced.

So, to sum up these fifty-two cases, one sees that five patients died and of the surviving thirty-five whom we could trace, twenty-eight are quite well, five have occasional pain, one is suffering from pulmonary tuberculosis and one died from that complaint.

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TUBERCULOUS MESENTERIC GLANDS.

Results. Second Series. Summary.

Condition of glands	No. of cases	Complications	Immediate results	After-histories
Non-caseating ...	... 20 ...	Acute appendicitis	2 ... R. 19, D. 1 ...	Quite well 10
		Intussusception	3	Occasional pain 2 Poor health 1 Died (pulm. tub.) 1 No reply 5
Caseating... ..	... 17 ...	Acute appendicitis	2 ... R. 14, D. 3 ..	Quite well 11
		Meckel's diverticulum	1	Occasional pain 2
		Intestinal obstruction	4	No reply 1
Caseating and calcareous	4 ...	Acute appendicitis	... R. 4 ...	Quite well 2
				No reply 2
Calcareous ... ..	... 11 ...	Acute appendicitis	1 ... R. 10, D. 1 ...	Quite well 5
		Distended gall-bladder	1	Occasional pain 1
		Hæmatemesis	1	No reply 4
		Melena	1	

I hope that this discussion will convince the profession that tuberculous disease of the mesenteric glands is a serious disease associated with a comparatively high mortality and in its later stages liable to require elaborate surgical treatment.

CONCLUSIONS.

I still subscribe to the conclusions at which I arrived in 1918 and I will therefore re-state them.

(1) The mesenteric glands may be the only part of the body affected by tuberculosis, and especially, they may be affected apart from tuberculous peritonitis.

(2) There is a tendency to spontaneous recovery as evidenced by calcification.

(3) The condition is not limited to childhood.

(4) A diagnosis can be made with reasonable certainty without the presence of a palpable tumour.

(5) Pain is characteristic in type, and is due to spasm of the affected segment of small intestine.

(6) This spasm may give rise to intussusception.

(7) Complications are frequent and may be serious.

(8) The caseating form of tuberculous peritonitis is probably the last stage of caseating mesenteric glands.

(9) Operative treatment should be undertaken owing to the difficulty of excluding complications in apparently typical cases and such treatment gives good prospect of permanent cure.

Finally, to sum up the present position of abdominal tuberculosis, I have the impression that we are seeing fewer cases than we used to see. (I was constantly operating for tuberculous peritonitis and its complications twenty years ago.) This may be due to two causes: (1) the surgeon may see fewer cases because modern methods of medical treatment cure more cases, or at least reduce the incidence of complications; (2) since the war, children have been much better fed, better housed and better clothed, and therefore are better fitted to resist infection. If the milk supply could be controlled an enormous step forward would be taken, but it seems very difficult to introduce the necessary legislation. I should be glad to be assured that the time is approaching when surgery will have no part in the treatment of abdominal tuberculosis.

Mr. ZACHARY COPE.

The term "abdominal tubercle" embraces many widely differing conditions arising from a variety of sources. To limit the field it is necessary to exclude genito-urinary tuberculosis and psoas abscess associated with active spinal caries. Three forms of the disease then remain—glandular, intestinal and peritoneal.

The glandular form may affect few or many of the mesenteric and intraperitoneal glands. The most common group to be affected is the ileo-cæcal. The pathological condition of the gland may be small and fleshy, large and fleshy, caseous, or either partly or wholly calcified. It is very usual to find calcified glands in people who appear healthy.

When the intestine is affected the lesion may take the form of an ulcer eating deeply into the bowel wall, generally in a circular direction, or such an ulcer may cicatrize and form a stricture; an important variety is cæcal tuberculosis, which generally assumes a hypertrophic form.

The peritoneum may be affected locally by miliary tubercles forming on the serous aspect of an ulcer of the bowel, or a very widely spread miliary tuberculosis may be found over almost the whole of the serous membrane. If of long standing the peritoneum may be very thickened (up to half an inch) by tuberculous infiltration. In such cases fluid is often poured out. Infiltrating masses are sometimes found, especially in the right iliac fossa.

These various forms may be combined, and in fact generally are so in the later stages of the disease. Caseous glands, ulcerated bowel, shrunk and infiltrated omentum and mesentery may make up a very serious clinical picture.

The clinical appearance of abdominal tuberculosis varies with the pathological condition. Fairly extensive foci of tubercle may be present without any obvious or definite clinical symptoms.

I once operated on a very healthy lad of about 10 for an inguinal hernia. On opening the sac numerous tubercles were found on the interior of the sac and within the peritoneum. The lad made an uninterrupted recovery, and a year later his condition continued to give satisfaction.

As a general rule, however, abdominal tubercle is associated with a definite deterioration of general health, and in every case of progressive loss of strength the possibility of its presence must be carefully considered.

The chief manifestations as presented to the surgeon are as follows:—

(1) *Colicky pains* may be the only symptom complained of, especially with the small, fleshy type of enlarged gland or early ulceration. The pain is short, often severe, and may be accompanied by retching or vomiting. There may be fever. A distinguishing feature of the pain is its lack of definite localization. It may be felt in different situations at different times. When chiefly localized in the right iliac fossa it may be impossible to distinguish it from appendicitis, and exploration is then a suitable diagnostic measure. This form is chiefly met with in children.

(2) *A tumour* may be formed by large, fleshy glands, caseous masses, infiltrated rolled-up omentum, or hypertrophic cæcal tuberculosis. The presence of a tumour is frequently accompanied by severe attacks of pain and may simulate intussusception or neoplasm. Subacute intussusception can easily be mistaken for abdominal tubercle unless the history of onset is clear and typical. Hypertrophic cæcal tuberculosis is often mistaken either for appendicitis or cancer of the cæcum until the abdomen is opened, and sometimes, until sections are prepared, the diagnosis from growth may be in doubt. Caseous glands which form a tumour are usually accompanied by other signs indicative of tubercle.

(3) It may happen that the presence of tubercle may only be suspected when an

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X-ray is taken and reveals definite evidence of *calcified glands*. If in the line of the ureter such glands may be distinguished by their irregular outline or unequal density; an opaque catheter passed up the ureter will clear up the diagnosis.

(4) Adhesion to a calcified gland is a common cause of *acute intestinal obstruction*. The symptoms of this are well known, but it is worth noting that since such patients have overcome the tuberculous infection there is little evidence externally to point to the actual cause of obstruction. The relief of obstruction in these cases is often extremely difficult, since the adherent coil may be deep down at the back of the abdomen.

Intestinal obstruction may also be caused by tuberculous stricture, or by a tuberculous mass in the cæcum obstructing the ileo-cæcal valve. Exploration is usually necessary to determine the exact nature of the lesion in these cases.

(5) Intestinal ulceration leads to *diarrhæa*, for which the surgeon is seldom consulted, but when the ulcer perforates either locally or into the general peritoneal cavity, a faecal fistula or peritonitis may necessitate a surgical opinion. A faecal fistula is usually formed in the region of the umbilicus.

(6) *Peritonitis* due to perforation into the general peritoneal cavity is usually a fatal complication, for it attacks suddenly a patient who is already greatly debilitated by the primary intestinal lesion. It may result from an acute miliary invasion of the peritoneum without any ulceration of the intestine. This form is of more favourable prognosis. In children it may give rise to the usual symptoms of acute peritonitis with abdominal pain, rigidity, tenderness and hyperæsthesia. The lesions are usually more in evidence in the right iliac fossa and appendicular abscess may readily be diagnosed by mistake.

(7) *Ascites* results from subacute miliary infiltration of the peritoneum. In children the condition can usually be readily diagnosed by considering the history, general aspect and local condition, but I have known a large hydronephrosis extending from the diaphragm to the pelvic floor in a child aged 6 to be mistaken for tuberculous ascites.

In the case of adults there is often a difficulty of diagnosis between cancerous and tuberculous peritonitis. It is interesting to note that whenever I have been in doubt between the two diagnoses, the issue has proved the condition to be cancer in every case.

TREATMENT.

The indications for surgical interference in abdominal tuberculosis can be briefly enumerated:—

- (1) To let out ascitic fluid (which, as a rule, is deficient in protective substances).
- (2) To remedy intestinal obstruction (either acute or chronic).
- (3) To suture perforations and drain septic peritonitis.
- (4) Occasionally to remove large fleshy or calcified glands which are causing symptoms and which can be enucleated without injury to the vessels of the mesentery.
- (5) To drain abscesses consequent on the breaking down of caseous glands.

Dr. M. A. CASSIDY.

I agree with Mr. Carson that tuberculous enteritis seems to be of less common occurrence in recent years. I attribute this partly to the general satisfactory decline in the incidence of all forms of tuberculosis, and partly to the increasing tendency towards the segregation of tuberculous patients in special departments and hospitals, so that much valuable clinical material is lost to the general physician as well as to the medical student, who, unfortunately, is unable to spend much time in the numerous special departments which now surround him. It would seem that in tuberculous peritonitis there is no great diminution of incidence, but that there has been a change in the age and sex incidence since the publication of Osler's statistics.¹ I find that during the ten years

¹ Osler, "Textbook of Medicine," 8th ed., 1912, p. 180.

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1910-1924 (excluding the war years 1916-1920) there were 267 cases of tuberculous peritonitis treated at St. Thomas's Hospital: during the preceding ten years only 183 cases were admitted. Of the recent 267 cases 90 per cent. were aged under 30, 75 per cent. under 20, and 33 per cent. under 10 years. Whereas the corresponding figures in Osler's cases (357) were 53 per cent. under 30, 28 per cent. under 20, and only 8 per cent. under 10 years. Moreover in Osler's series females were twice as frequently attacked as males, the actual ratio being 131 to 60. In the St. Thomas's series there was no marked sex disproportion,—54 per cent. males, 45 per cent. females. As to the classification of tuberculous peritonitis, I agree that there is no very sharp line of division between the ascitic and the adhesive plastic varieties, either of which may be acute or subacute; 26 per cent. of the St. Thomas's series of cases were of the ascitic type. I cannot concur with the suggestion that a proliferative peritonitis is to be regarded purely as indicating repair: for some of the most malignant and progressive cases are dry and proliferative from the first. With regard to *prognosis* I think it is fair to say that the outlook in uncomplicated tuberculous peritonitis is uniformly good. In fact I am accustomed to tell students that if one had to be infected with Koch's bacillus and were given the choice of site, the peritoneal cavity would be the place to select, for tuberculosis in this situation seems to afford the best chance of a complete and permanent recovery, often with little or no resultant disability. In the St. Thomas's Hospital series of 267 cases the mortality was only 9.7 per cent. When one investigates these fatal cases, one finds that death is often due to accidental complications such as perforation or obstruction, whereas in cases of death caused solely by the tubercle bacillus there was usually widespread disease and often cavitation of the lungs; and other viscera were frequently involved. Uncomplicated tuberculous peritonitis, whether ascitic or plastic, acute or chronic, if recognized early and treated efficiently, may run a long course and give rise to great anxiety from time to time, but in the end recovery is usually complete.

The *symptomatology* is extraordinarily variable, and consequently tuberculous peritonitis may be, of all diseases, the easiest to recognize, or conversely it may deceive us into making the most horrid diagnostic blunders. The condition may be clinically latent, discovered perhaps years afterwards by some observant radiologist or surgeon.

Here is the skiagram of a man aged 45 taken shortly after an injury to the lumbar region. A year later another skiagram taken on account of persistent pain in the right buttock showed a calcified gland on the left side of the lumbar spine. Neither before nor during this period had the patient experienced any sort of abdominal symptoms and his general health was excellent.

We are all familiar with those patients, usually children or young adults, in whom symptomless tuberculous tumours are found in the abdomen, sometimes large, sometimes freely mobile; and we have seen these patients grow into healthy adult life and the tumours disappear, often with only slight treatment. *Pain* is an extraordinarily valuable sign in tuberculous peritonitis; it may be absent, or severe, continuous and of long duration; it seems to be more common with adults than with children, and in plastic peritonitis than in ascitic.

Either constipation or diarrhoea may occur; the latter may be associated with the passage of fatty stools, due, as suggested by Ryle,¹ to defective absorption owing to obstruction of the lacteals by tuberculous mesenteric glands.

DIFFERENTIAL DIAGNOSIS.

Difficulties most frequently arise in the cases with acute onset, which are often, quite properly, subjected to immediate laparotomy, being usually mistaken for acute

¹ Ryle, *Guy's Hospital Reports*, January, 1924.

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appendicitis—especially is this the case with children during the first twenty-four hours of their attack. No great harm is done, provided that the surgeon is not tempted to remove more than the appendix, and that he leaves mesenteric glands severely alone. Quite apart from the beneficial effect which often follows laparotomy in these cases, it is well to have the diagnosis definitely established so that a strict course of post-operative treatment can be insisted upon. Of the St. Thomas's Hospital 267 cases, seventeen were explored as acute abdominal cases, and in thirteen others the provisional diagnosis was "appendicitis." In adults the more chronic cases may be confused with carcinoma or with chronic inflammatory conditions, actinomycosis or even amœbiasis.

Barker¹ has reported a case of adeno-carcinoma of the ascending colon in a man aged 31, which mimicked tuberculosis in that a lump in the right hypochondrium was associated with pyrexia, diarrhoea, anæmia and no great wasting, in spite of a five years' history. In my ward at St. Thomas's Hospital there is a man aged 51 who was admitted cachectic, afebrile and with a subacute intestinal obstruction evidently due to a mass in the left hypochondrium. There was also a little ascites and the diagnosis of obstructive carcinoma of the colon seemed sufficiently clear. Yet on laparotomy the condition proved to be one of tuberculous peritonitis.

It is clear from these two cases that abdominal carcinoma and abdominal tuberculosis may very closely resemble one another. The presence or absence of pyrexia is evidently not conclusive either way. The demonstration of pulmonary tuberculosis points strongly towards a similar abdominal condition, though there is no reason why a phthisical subject should not become carcinomatous. A very important sign of tuberculous peritonitis, especially when not associated with marked ascites, is a peculiar and characteristic rubbery resistance to palpation all over the abdomen, which is often inaccurately described as "doughy." Chronic inflammatory, plastic peritonitis may also imitate tuberculous peritonitis very closely, as in the following case:—

A man aged 45 with a long history of past ill-health, due to service in the tropics, became ill in December, 1924, complaining of abdominal pain, constipation and vomiting. He was in the bush in Nigeria at the time, and some weeks elapsed before he came under the care of Mr. W. B. Johnson at Kaduna, where he was found to have an indefinite mass in the right flank and also a right-sided pleural effusion, which was aspirated; the cells in this fluid were too degenerate for a count. He was given a course of emetine and sent home, where he came under my care six months later. He was in a cachectic condition, with an evening temperature of 100° to 101° F. There was a large mass occupying almost the whole of the right side of the abdomen, and a marked dullness at the base of the right lung. His blood-count revealed a severe secondary anæmia with a white-count of 11,200; no amœbæ or cysts were found in the stools; aspiration of the liver was negative, and there was little improvement after another course of emetine. The diagnosis therefore seemed to lie between a chronic inflammatory condition, growth, and tuberculous peritonitis. The abdomen was opened by Mr. Norbury on June 15, 1925, when a dense mass of adherent bowel and omentum was found below the liver. After some exploration of this mass it was decided that it would be unsafe to proceed any further; moreover the appearances were very suggestive of tuberculosis, and one mesenteric gland appeared to be caseous. A piece of parietal peritoneum removed for microscopy was reported to be of a chronic inflammatory nature. The patient was sent to a sanatorium, where his condition improved rapidly till early in September, when the incision broke down and foul smelling pus was discharged. This sinus was opened up by Sir Hamilton Ballance shortly afterwards, when the temperature subsided and his condition still further improved. On December 31, Sir Hamilton Ballance opened the abdomen again, found many adhesions, and removed the appendix, the distal extremity of which was fibrosed. He found no evidence of tuberculosis, and considered the condition to have been a chronic inflammatory one. Unfortunately no microscopical examination of the appendix was made.

Cirrhosis of the liver may be confused with tuberculous peritonitis. The occasional occurrence of this condition in young children must be borne in mind. In older subjects the two conditions may, of course, be co-existent.

From our earliest days we have been warned against confusing ascites with an

¹ Barker, "Clinical Medicine," 1922, p. 196.

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ovarian cyst. Personally I have only known this mistake made once, when many years ago Mr. Victor Bonney and I together decided that a case of tuberculous peritonitis was one of ovarian cyst—and revised our diagnosis after operation! I should like to know whether these two conditions are so often mistaken for each other as the text-books imply.

TREATMENT OF TUBERCULOUS PERITONITIS.

I think we are all agreed as to the rapid improvement which follows a simple laparotomy in ascitic cases which are not improving satisfactorily on adequate medical treatment. I suppose, too, that laparotomy will always be preferred to aspiration, a procedure which, personally, I consider to be so risky as to be unjustifiable in tuberculous peritonitis. Apart from this, treatment should be conducted on sanatorium lines, with rest in bed in the open air for many weeks after subsidence of pyrexia, ascites, and other symptoms and signs. I am quite satisfied as to the beneficial effects of heliotherapy in this condition. Long before the present popularity of light treatment it was my custom to treat all my cases of tuberculous peritonitis by graded exposure to sunlight, or in winter by exposure to artificial light, and the results were often striking. Unfortunately I cannot give you any statistical evidence, only a very strong personal conviction. I note, however, that Roxburgh¹ states that at St. Bartholomew's Hospital "tuberculous peritonitis did not respond, more than half the patients being worse, or at any rate no better, after radiation." I would be interested to learn the experience of workers in actino-therapy at other hospitals.

The only medicine I give these patients is cod-liver oil. I do not apply mercurial or iodine inunctions to the abdomen.

TUBERCULOUS ENTERO-COLITIS.

This disease has recently been exhaustively dealt with by Lawrason Brown and Sampson.² In this country the tendency has been to regard intestinal tuberculosis from two standpoints, namely (1) a terminal condition associated with advanced pulmonary tuberculosis, characterized by abdominal pain, and usually by intractable diarrhoea, though sometimes by constipation, and always ending fatally; (2) the somewhat uncommon condition known as hyperplastic ileo-cæcal tuberculosis, usually mistaken for carcinoma.

Judging by Brown and Sampson's work it seems probable that intestinal tuberculosis is (1) a more common early complication of pulmonary tuberculosis than has been supposed; (2) that it can and should be diagnosed at an early stage, and (3) that, if efficiently treated, recovery from it is by no means exceptional.

It seems certain that intestinal tuberculosis is almost invariably secondary: out of 22,725 tuberculous autopsies collected by Gant,³ primary intestinal tuberculosis was found in only 7.22 per cent. of cases, whereas it is present in from 50 per cent. to 80 per cent. of autopsies in fatal cases of pulmonary tuberculosis. At the Trudeau Sanatorium, where only favourable cases are accepted, Brown and Sampson diagnosed intestinal tuberculosis in twenty-three out of 361 routine cases; of these twenty-three cases, eighteen patients had moderately advanced, and five far advanced pulmonary tuberculosis. Brown and Sampson base their diagnosis almost entirely on the results of radiographic examination: they consider the symptomatology of early intestinal tuberculosis to be so vague that diagnosis based on symptoms alone is unreliable. Such symptoms are—any digestive disturbances, marked constipation, failure of the pulmonary condition to improve, or a decrease in pulmonary symptoms without any corresponding improvement in the patient's general condition, alternate diarrhoea and constipation, and marked nervousness. Erickson found diarrhoea in 66 per cent., constipation in 28 per cent. of early cases.

¹ *St. Bartholomew's Hospital Journal*, November, 1920.

² Lawrason Brown and Homer Sampson, "Intestinal Tuberculosis," Baillière, Tindall and Cox, 1926.

³ Gant, *New York State State Journ. Med.*, 1911, pp. 401-406.

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The presence of tubercle bacilli in the stools is of no diagnostic importance in the case of intestinal tuberculosis, for they are said to occur in 85 per cent. to 90 per cent. of all patients with tubercle bacilli in the sputum, and they may be found also in the stools of consumptives who produce no sputum. In fact, the number of tubercle bacilli present in the stools seems to be largely a function of the amount of tubercle-containing sputum swallowed. Thus Loll¹ found that if patients with copious positive sputum were ordered not to expectorate for two or three days their faeces swarmed with tubercle bacilli, whereas previously none, or few, were found. The benzidine test for occult blood, in the stools of dieted patients, may be of assistance as suggesting ulceration, not necessarily tuberculous. A negative benzidine test is of no great value. A marked leucocytosis in the blood, in the absence of cavities or other complications, is said to be suggestive.

The X-ray findings upon which Brown and Sampson rely are epitomized as follows :

General hypermotility, with complete or nearly complete emptying of the colon in twenty-four hours; failure of the caecum or of the ascending colon and hepatic flexure to retain the barium; or the presence of spasm or filling-defects (irregular contour, lack of haustrations); or of confirmed segmentation, with or without dilatation of some coils of the small bowel; ileal stasis; and gastric retention; these are the essential points when the intestine is studied at the third to the tenth hours, and again at the twenty-fourth hour. These findings indicate ulceration only, but when pulmonary tuberculosis is present tuberculous ulceration can be safely diagnosed.

Stierlin's sign² was described by himself in 1911 as follows :

In infiltrating and ulcerative involvement of the caecum and ascending colon there is absence of the normal shadow of this part of the colon, as shown in the skiagram six or seven hours after the barium meal, while the terminal ileum and transverse colon are filled. Consequently, the early as well as the later stages of the so-called caecal tuberculosis can be diagnosed by this means even in cases undiagnosable by the ordinary clinical methods.



FIG. 1.—Barium enema showing filling defect of pelvic colon due to hyperplastic colonic tuberculosis (Dr. Bertram Shires).

¹ Loll, W., *Beitr. z. Klin. d. Tuberk.*, 1921, xlviii, p. 209.

² Stierlin, *Münch. med. Woch.*, 1911, lviii, p. 1231.



FIG. 2.—Barium meal showing filling defect at ileo-caecal junction with ileal stasis due to hyperplastic ileo-caecal tuberculosis (Dr. Bertram Shires).



FIG. 3.—Small bowel obstruction and gastric residue due to multiple ileal stenoses of tuberculous nature; five hours after meal (Dr. Bertram Shires).

Section of Surgery.

SUB-SECTION OF PROCTOLOGY.

President—Mr. J. P. LOCKHART-MUMMERY, F.R.C.S.

DISCUSSION ON DIVERTICULITIS.

Dr. EDMUND SPRIGGS.

DIVERTICULITIS is not uncommon, though much rarer than the state of diverticulosis which precedes it. Diverticulosis was found in 8.3 per cent., viz., in 158 cases in 1901 consecutive radiological examinations at Duff House and Ruthin Castle; of these 12 per cent. were cases of diverticulitis. There is no definite boundary between the connotation of the two terms. If any symptoms arise from a diverticulous area some irritation or inflammation is then present and the term diverticulitis, strictly speaking, is applicable. I have suggested, however, that that term should be reserved for the late stage of the disease, when there is a typical clinical picture, and a definite radiological and pathological state.

CLINICAL FEATURES.

These are those of a low form of inflammation in the large bowel in the left lower abdomen, spreading to neighbouring structures.

Abdominal discomfort, less often *pain*, not as a rule related to food, is situated in the lower abdomen, about or below the navel, but especially in the left iliac fossa. It may be intermittent, with intervals of several weeks or longer between the attacks. The pain may be severe, and a general feeling of ill-health may accompany it. One of my patients had a severe headache with each bout. Motoring sometimes makes the pain worse. A dragging sensation and backache may be present on and off for years.

General flatulence and a feeling of distension are usually mentioned and may be the only symptoms. An advanced state of diverticulitis may, indeed, be present with but little complaint; one patient complained of constipation only. In several there was no actual pain.

In cases of implication of the bladder there may be frequent micturition, sometimes painful, after the bowels are opened. The pain may pass into the left iliac fossa or the rectum; or a painless micturition may be followed by pain in the tumour.

Constipation is frequent, or irregularity of the bowels, or diarrhoea, or a sense of incomplete evacuation. The increasing constriction leads slowly, usually very slowly, to obstruction.

A sausage-shaped tumour, sometimes tender, but not always, can be felt in the left iliac fossa, except in the very obese. Diverticulitis may occur at other parts of the colon [11].

Hæmorrhage, per rectum, excluding that from piles, we have seen three times.

The radiological features of diverticulitis have been established by my colleague, O. A. Marxer, and are definite. With a barium meal or enema, typical rounded, oval or crescentic shadows of the barium in the diverticula will usually, though not always, be recognized in the neighbourhood. They are not, however, the characteristic features; these are the spike, or palisade-like projections of barium shadows from the lumen of the bowel, the wall of which is thickened (hypertrophic) and fixed. A series of films, when superimposed, shows no variation in the outline of the shadows, although there may be vigorous and irritable contractions of the

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bowel wall above and below, or even in the same part of the gut opposite to the hypertrophic area.

The *pathological features* are those of a chronic inflammation of the pelvic colon, arising at first from one or more diverticula, but now involving all the coats of the gut, including, sooner or later, the peritoneal coat, and spreading to surrounding parts, especially, in men, to the bladder, but also, at times, to the uterus, ovary, small intestine or abdominal wall.

Leucocytosis is frequent. In late stages small, or sometimes larger, abscesses form in the inflamed or septic area. Metastatic abscesses are unusual, but have been recorded at least twice.

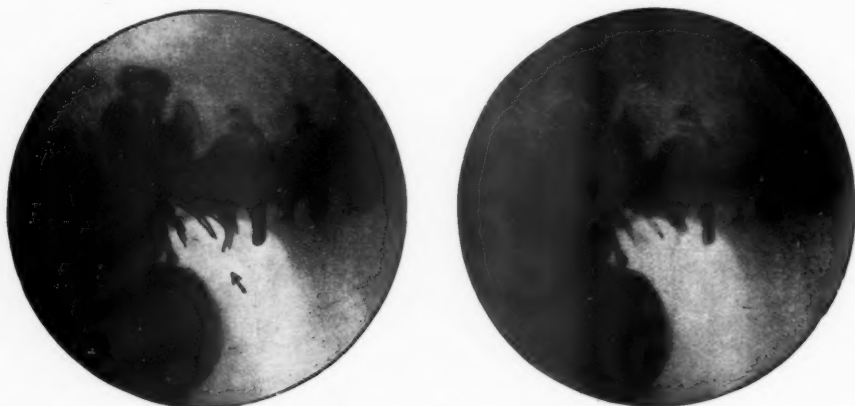


FIG. 1.—The arrow points to a rigid area with spike-like processes.

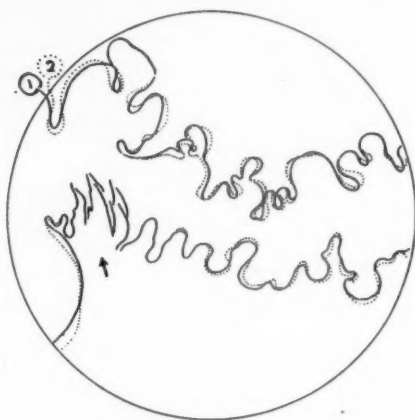


FIG. 2.—Tracing of two superimposed films of a series taken at intervals of one second while the breath is held. Movement is shown in all parts of the bowel excepting the spiked rigid area.

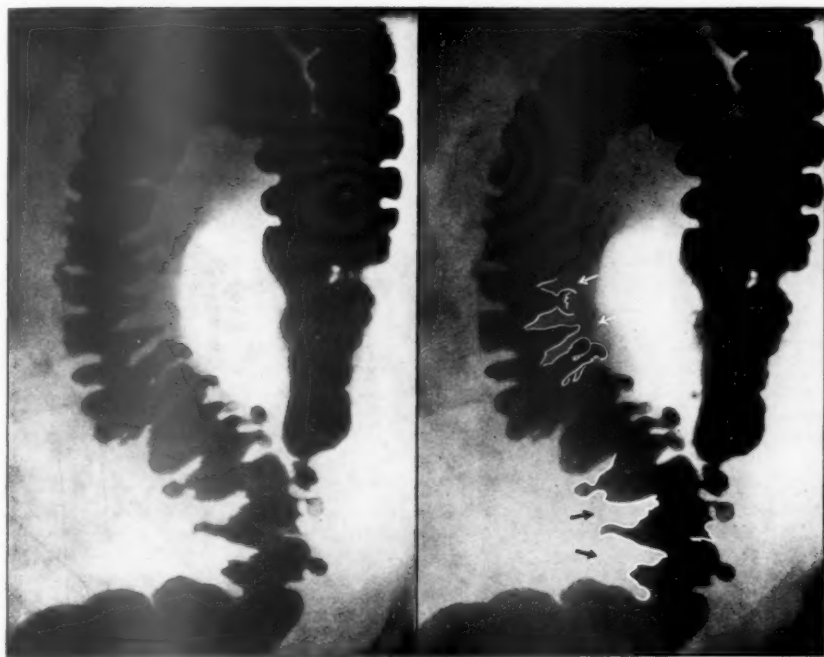


FIG. 3.—Sigmoid showed two areas of diverticulitis. Compare figs. 1, 2 and 3 with figs. 5, 6, 8 and 9 in which there is much deformity but no rigidity.

It is the combination of these three pictures, clinical, radiological and pathological, for which it is suggested that the term "diverticulitis" should be reserved.

At a former meeting of this Section, now some seven years ago, I proposed the term "diverticulosis" for the earlier stages of the disease, which are often free from symptoms, and always, with the exception of the occasional rupture of a single pocket, free from symptoms of the severity of those above described. I did not know until this year that de Quervain, the Swiss surgeon, had made the same proposal in 1914 in a paper [5] not then accessible to me. The distinction between the phases is needed, for diverticulitis is a definite and serious disease from which many subjects of diverticulosis never suffer.

SYMPTOMS OF EARLIER STAGES OF THE DISEASE.

In the prediverticular stage, first described by O. A. Marxer in 1923 [13] [2], no symptoms can, as a rule, be recognized, though the area of the bowel affected, as observed with the X-rays, is often in a more irritable condition than in some cases of established diverticula. The area is sometimes tender on the X-ray table. In one case (No. 3658) in which the colon was strewn with patches of the prediverticular state, pain was complained of as the barium entered the affected part of the bowel. In another (No. 3281) the descending and pelvic colons were in the prediverticular state.

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This part of the gut was tender and rigid, and there was aching over the sacrum, after evacuation.

The stage of established diverticula, short of diverticulitis, may be quiescent for years. In our former description of 100 cases, in about half no symptom was complained of, except, in some, constipation.

In 52 recent cases, excluding those of diverticulitis as above defined, in 25 there were no symptoms. This is the same proportion as in the earlier series. Of the remaining 27, 8 complained of abdominal pain, generally below the navel. In two cases in which there were pockets at the apex of the sigmoid loop, and this lay over to the right, the pain was referred to the right side. Thirteen had discomfort or

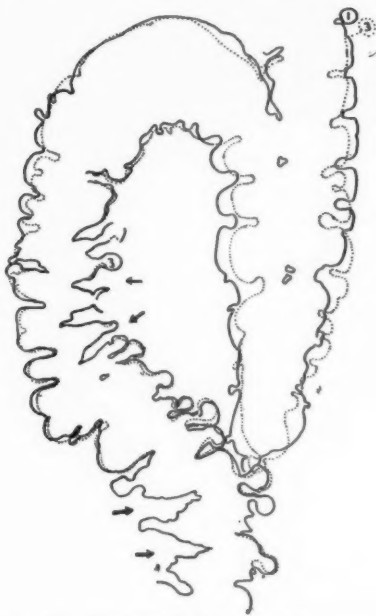


FIG. 4.—Tracing of two superimposed films from the same patient. The areas of diverticulitis shown by the arrows are immobile.

distension, and 4 irregular action of the bowels. Flatulence was a frequent complaint. Examples may be given of two cases:—

I.—A Case of Established Diverticulosis not showing Diverticulitis (No. 3413).—A man of 61 has felt "indigestion" and pain for two years. Seven weeks ago he strained his back lifting a weight; since then the pain below the navel has been worse, with much rumbling and gurgling. Pain may be felt half an hour after taking food, but not constantly; it never lasts all day; is dragging, colicky, and more on the left than the right. Nothing has been found to relieve it. Tendency to constipation last few weeks.

Examination.—Average nutrition. No abnormal physical signs. Septic teeth recently removed. With X-rays the appendix showed some constriction, but, filled with barium, was not tender, and was not thought to be causing symptoms. Large diverticula were present in the ascending and transverse colon, with irregular segmentation; also small pouches and the prediverticular state in the pelvic colon. No evidence of hypertrophic changes.

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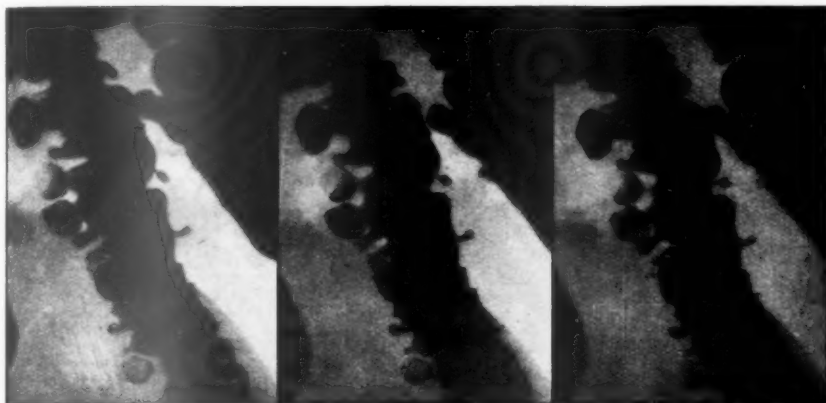


FIG. 5.—Diverticulitis of descending colon; lateral views, serial pictures (films 1, 3, and 6).

II.—A Case showing Early Diverticulitis (No. 3518). Male aged 66. Eighteen years ago dragging sensation and discomfort in left iliac region. A year ago left renal colic and passage of stone. Tendency to constipation. Discomfort in left abdomen persisted. Ten months ago was X-rayed and sigmoidoscoped with negative result. *On admission* to Ruthin Castle complained of stiffness and pain mostly in left lower abdomen, worse on changing position, borborygmus, much flatus and fatigue. *Examination:* Thin, looks healthy but anxious. Blood-pressure: resting 180—130, with mild exertion 190—135. Teeth: An apical abscess and some periodontitis. Lumbar spondylitis. X-ray: Diverticula, many of good size, throughout colon. In sigmoid flexure hypertrophic changes for several centimetres. After a month's treatment the bowels acted daily; discomfort and pain in the back much less. Felt well. Weight + 6 lb.

ÆTIOLOGY.

The cause of diverticulitis is clear. It is due to inflammation spreading to the bowel wall from a pre-existing diverticulosis, the retained content of which has become septic.

The pockets are acquired and not congenital. They are found only rarely (ref. to Erdman's number) in children. The average age of 158 patients was between 57 and 58. 109 were men and forty-nine women. We have seen diverticula in a woman aged 25, who is not, however, in this series. One of these patients, a woman aged 40, showed areas of diverticulosis over the whole colon. She was said to have had dysentery ten years before.

The ætiology of the pre-existing diverticulum is as yet unknown. In its beginnings, the prediverticular state, there is the appearance of irritation if not of inflammation involving sometimes the whole circumference of the gut.

This stage precedes, as its name implies, the formation of the small herniæ which then push their way through the weak places in the bowel wall. It is the important active stage of early diverticulosis, and requires much further study. It was observed in twenty-eight out of the last fifty-eight cases of diverticulosis, not including any reported in our previous paper. After the passing off of the prediverticular state the haustra and segments tend to lose their symmetry. This may be interpreted as due to

the muscle fibres being thinned in places with corresponding bunching in others, just as a cut or a weakening at one place in an elastic band will result in bunching of the part which retains its elasticity. Judging by repeated observations at intervals of a year or more, any given haustrum tends to remain distorted in the same manner, and this haustral asymmetry may persist in a flabby diverticulous bowel, apart from the presence of excess of fat or evidence of any thickening of the wall.

It appears probable that damage to muscle fibres occurs at this stage, and, as a consequence, the mucous membrane herniates at weak places to form the little pockets. When small herniæ are once formed their gradual enlargement is an obvious process. Their distension is to be ascribed to contraction of the bowel higher up raising the pressure in the lumen. Pressure from without, e.g., straining, would protect the pouches. A study of serial films shows that the diverticula fill as a rule during inhibition of the bowel, as if from suction or from internal pressure from above, and empty during contraction.

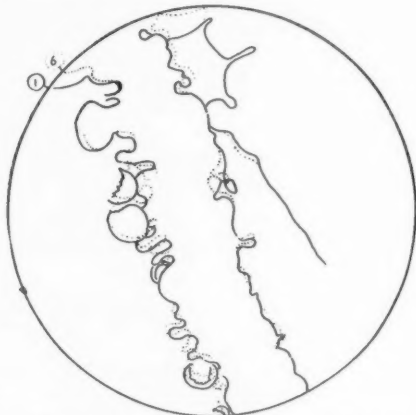


FIG. 6.—Tracing from same showing mobile wall; no inflammatory rigidity.

Spasm, which has been advocated as a cause [3] would therefore prevent filling and be adverse to the development of pouches in the spasmodic area. We see spasm associated with all sorts of mucosal lesions, including irritation from diverticulous areas. Seldom, however, do such cases, when non-diverticulous, develop diverticula. In the prediverticular state the bowel around may be hyperactive, but enough spasm to cause a narrowing of the lumen is only seen when the entire circumference is involved. Further, in cases of chronic diarrhoea, where inhibition of the bowel wall is much in evidence, the diverticula attain a larger size. Each time fresh material enters the neck of the pouch there is a tendency to distension and enlargement of the pouch. Probably, therefore, the pockets are bigger in patients with loose motions because they fill and empty oftener.

ILLUSTRATIONS.

Constipation is generally assumed to be an important factor. In this new series of fifty-eight patients with diverticulosis there was delay in the colon as established by X-rays in twenty-four; in twenty-five there was no delay. In our former series of

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100 patients delay was found in fifty-seven. Roughly about half the patients are constipated when examined.

In diverticulitis there was delay in all but two.

In our previous paper we drew attention to the common association of diverticulosis with septic teeth, especially apical abscesses, and with arthritic changes in



FIG. 7.—Pre-diverticular state over greater part of colon; early diverticula of descending and pelvic colon.

the spine. Our later experience is that spondylitis has been observed in 21 out of the last 58 cases, a large proportion, though less than the 72 per cent. previously reported. In the 58 cases the teeth, if any, were X-rayed; apical abscesses were present in 18, in 12 apical periodontitis, and in 24 the teeth were nearly all gone, i.e., in only 2 were tooth roots present all normal. Alveolar resorption is, in those over 50, not reckoned as abnormal for this purpose.

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Association of diverticulosis with some infective state is almost universal, as the following figures of the last 58 cases (none of which were previously reported) show : Cholecystitis or gall-stones, 13 ; arthritis (other than spondylitis) and fibrositis, 6 ;



FIG. 8.—Lateral view of descending colon; anterior border, pre-diverticular state and one diverticulum, posterior border; irregular haustration. Seven years earlier, no diverticulosis.

peptic ulcers, 3 ; herpes, 3 ; dysentery, 2 ; lupus, 2 ; appendicitis, 4 ; iridocyclitis, 2 (1 with phlebitis) ; colitis, antral disease, 1 each—37 patients. Of the remaining 21 patients, all but 3 had either spondylitis or past or present septic teeth, and 12 had both.

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When the stage of diverticulosis is approaching, secondary septic foci might be expected. In the above list, from the time of onset both the lupus and the iridocyclitis may have been secondary to the diverticula; but the association with infective processes in other parts is present in the earliest stages. Infective foci elsewhere, however, might be accidental associations, especially in patients of between 50 and 60 with ill health of some kind. It would be of much interest



FIG. 9.—Advanced diverticulosis of descending colon; no spiked processes or rigidity. Bowel found soft and flabby at operation for duodenal diverticulum and gall-stone.

to work out the frequency and associations of diverticulosis in a series of presumably healthy persons, if such can be found available at that age. An asylum or workhouse population would be a useful field of inquiry. In any such research it must be borne in mind that the recognition of the early stages calls for delicate radiography, and that a starchy enema does not show well the prediverticular state.

The view that the beginning of the process is inflammatory, and perhaps associated with bacterial activity, is supported by the fact that it occurs most

frequently in the sigmoid flexure, and that its advanced form, diverticulitis, is commonly found in this situation. This is the part of the bowel, as we showed formerly, where fluid faecal matter is longest in contact with the mucous membrane of the gut.

In the 158 cases analysed in this and our former series the distribution was as follows:—

Pelvic colon	116
Descending colon	76
Ascending "	30
Transverse "	31
Whole "	23
Cæcum	7
Appendix	6
Rectum	4

The occurrence of the prediverticular state, and afterwards of formed diverticula, in patches in various parts of the bowel, suggests a local disease rather than any mechanical cause. The isolated diverticula occasionally seen, especially in the ascending colon and hepatic flexure, may be accidental pulsion pouches.

The study of a total of 206 cases leads to the view that diverticulosis is a disease and not a passive process, and it appears likely that in its beginnings it is an infective process, as it certainly is in the later stages.

OBESITY AND DIVERTICULOSIS.

So many diverticular people, in our series 50 per cent., are over weight, so that the presence of fatty tissue has been suggested as a cause, or a contributory cause, of the condition. Mr. R. Davies-Colley [4], [10] says that diverticula never occur when the intestinal wall is covered by peritoneum alone. He suggests that fat produces atrophy of the muscle from pressure, causing weak spots which become more infected, with further weakening of the muscle. He goes on to say that "No theory of ætiology can be held to be satisfactory which does not make fat the starting point in the process of which the herniation of the mucosa is the final outcome."

Mr. Marxer has examined our records from this point of view. He finds, first, that the average weight of the 100 diverticular patients reported in our former paper was no greater than that of the control series of 100 of the same age and sex. In the control series, indeed, the non-diverticular females show a higher average.

Secondly, the average weight of 900 non-diverticular patients was the same; nine of these being fat to one fat diverticular, i.e., the same proportion.

Thirdly, in looking for the earliest stages, and taking men under 40 years weighing over 160 lb., and women under 40 weighing over 150 lb., there were none diverticular. Whereas out of our series of 206 cases of diverticulosis there were six below these figures for age and weight, and five of the six were lean.

In our series, therefore, there is no evidence that diverticular patients are fatter than others of the same age, or that the fat-laden bowel offers less resistance to the early stages of the disease.

I am not prepared to say the same about the later stage of diverticulitis. One would expect that fatty tissue around an inflamed pouch would be less able to resist spreading infection than more vascular non-fatty tissue [6]. Nevertheless our patients with diverticulitis show an average weight of 5 lb. less than control patients of the same age.¹

¹ About 5 per cent. of the patients in our hospital are under treatment for over weight. If it be objected that they vitiate the average of the controls it may be pointed out that they are more than counterbalanced by the sufferers from wasting diseases. If fat, however, predisposes to diverticulosis they should increase the average weight of the diverticular rather than of the non-diverticular. The number is, however, too small to disturb the averages.

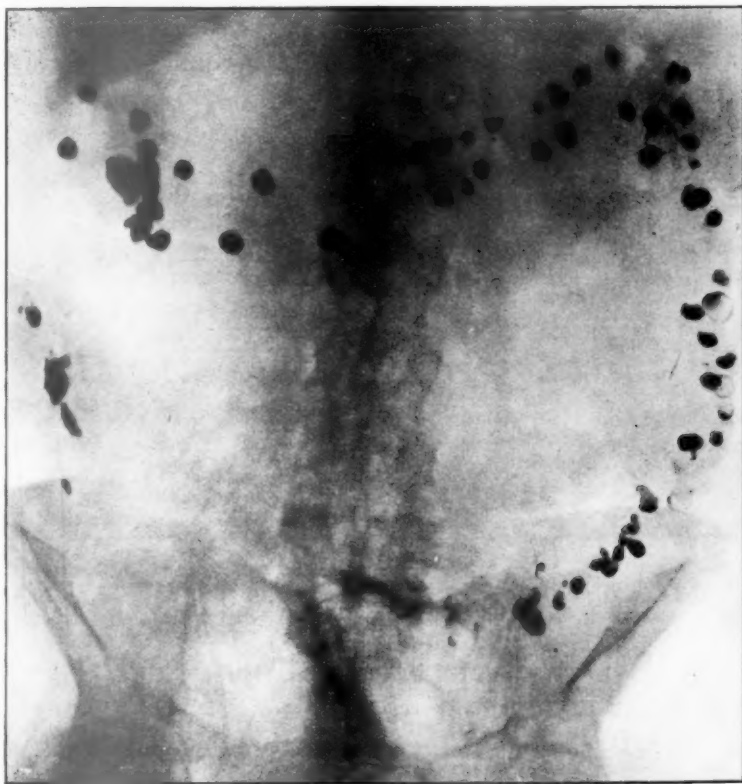


FIG. 10.—Extensive diverticula throughout the colon in a case where localized diverticulitis existed.

PROGRESS.

We have known a pouch of a diameter of 5 mm. form in a year, but progress is generally much less and may not be obvious at all.

It is not easy to say how long it takes for diverticula to develop as a rule. Mr. Marxer has seen two diverticula develop in one month in a patient who was being observed monthly. Other patients who were free from pouches have presented themselves with a good crop at various intervals from one to seven years afterwards. We have known a pouch, etc., of a diameter of 5 mm. form in a year, but progress is generally much less and may not be obvious at all. For example, examinations at an interval of one to two years have in some instances shown no change. In one case of diverticulosis of the sigmoid the patient returned after six years with early diverticulitis in that area.

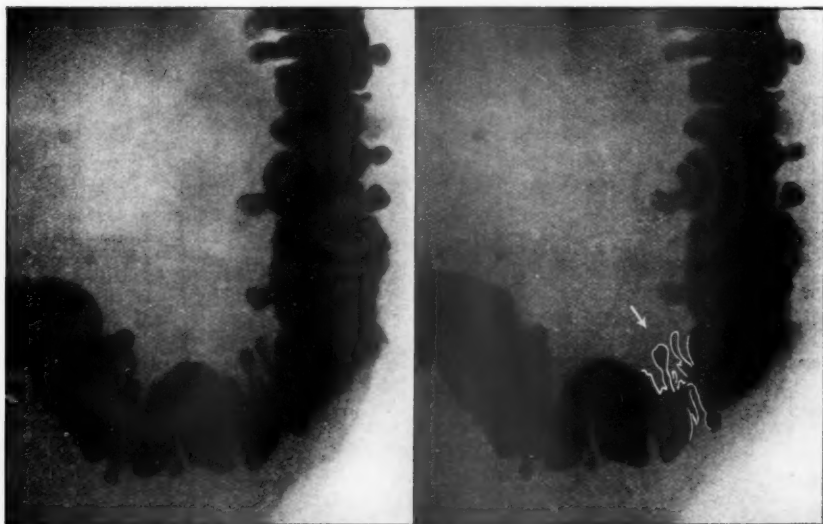


FIG. 10A.—Of the same case as fig. 10. Ring constriction (the hypertrophic changes of the bowel wall are trivial in comparison with the mass felt, which we presume is chiefly lipomatous fat).

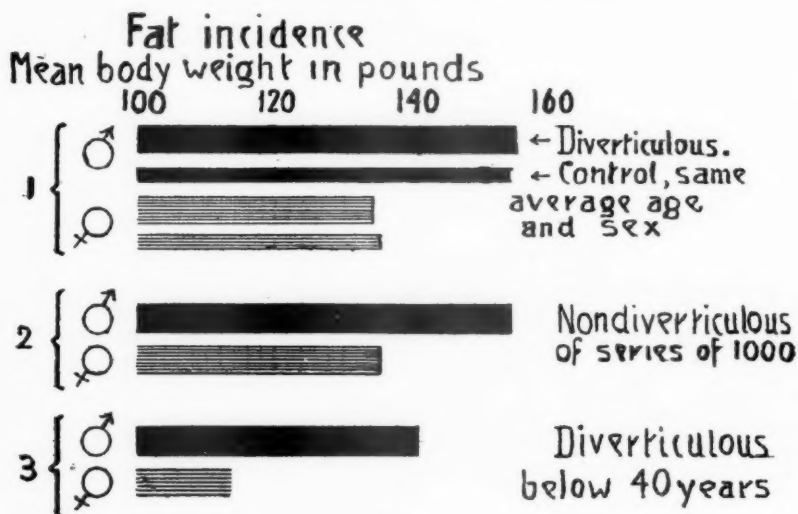


FIG. 11.

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In all cases of diverticulitis examined at intervals from eight months up to four years, some progress of the disease could be recognized radiologically.

Pouches with narrow necks do not empty easily, and in these faecal material is retained, being inspissated to form a *stercolith*. These faecal stones are not necessarily dangerous [15]. They are recorded as being present in diverticulitic areas and are regarded as a frequent cause of inflammation, but they are not always present.



FIG. 12.

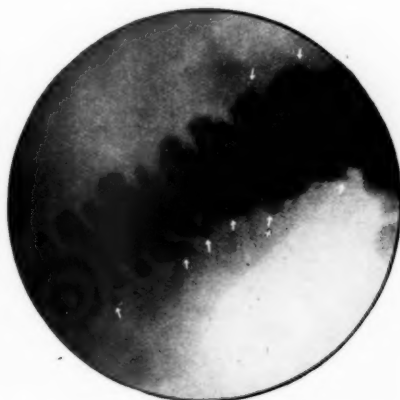


FIG. 13.

FIG. 12.—Shows a normal piece of transverse colon; the pre-diverticular state was observed in other parts.

FIG. 13.—The same piece of bowel eight months later showing small diverticula.

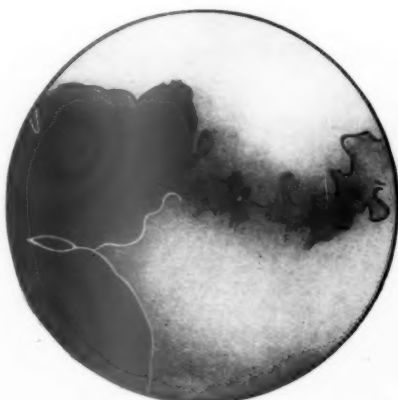


FIG. 14.—From the same patient as fig. 1 and of the same part of the bowel, five years later. Shows narrowing of the lumen from the advance of the inflammatory process. The diverticular orifices appear completely closed, yet material entered from the opaque meal.



FIG. 15.—Numerous hypertrophic areas of the sigmoid below colostomy contra-indicating its proposed closure.



FIG. 16.—Tracings of two films superimposed. Showing that the stercoliths bearing diverticula are particularly involved.

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PROGNOSIS.

Were the outlook judged by the end results of diverticulitis reported from the operating and post-mortem rooms of large hospitals! it would be grave indeed. A more hopeless condition to deal with than a suppurating sigmoid, involving and infecting surrounding parts, can hardly be thought of apart from active malignant disease. But, as we have shown above, diverticulosis may be quiescent over long periods of time. The cause of diverticulitis is inflammation in a pouch. What chance is there of preventing or allaying this? There is none unless the existence of the pouch is known. If every case of vague, persistent or recurrent abdominal discomfort were investigated, not only would diverticulosis, but many other conditions be discovered at a stage when the most help can be given. The doctor's difficulty is that patients want the aches and pains to be cured by a bottle of medicine or a pill. When such simple measures do not suffice the patient still would like to "wait and see how he gets on." The loss of health and efficiency from such delays is incalculable.

Patients sometimes are admitted with this disease who have been recently X-rayed, and yet the condition, even with diverticulitis, has not been discovered. These errors may be avoided by (1) using the butter-milk enema; (2) by making sure, by lateral and oblique views, that the different parts of the sigmoid loop are in profile when screening and taking films, and (3) taking a film after the lumen of the bowel is free from barium.

When a case of diverticulosis or early diverticulitis is recognized, the prognosis is good, as a rule, for reasonable health and for life [12]. The disease responds well to treatment. The graver complications occur chiefly in unrecognized or neglected cases. Both before and after hypertrophic changes, the physician and surgeon can, between them, in a watched case, guard against or deal with any developments that are likely to occur. The accident of the rupture of a pouch into the general peritoneal cavity is uncommon, but most of us know of such cases. It has the same risks as any other perforation and is dealt with in the same way.

TREATMENT.

The medical treatment consists in keeping the body, the alimentary canal, and especially the colon, as healthy and clean as possible; any sources of sepsis elsewhere that can be reached must be removed. The diet should be simple and regular with a good deal of fruit and vegetables. I have described fully elsewhere (reference, a diet which is found useful, but the preferences and state of each patient must be considered; the bowels are kept regular by diet, paraffin, and especially by attention to habit; this can nearly always be done.

The colon is washed out with saline every other day, but at *low pressure*, the funnel being not more than 18 in. above the level of the anus. The fluid runs in at low pressure just as well as, or often better than, at higher pressure, which may provoke spasm.

When diverticulitis is established the lavage is continued for months on end, and in some cases permanently, at regular intervals. Large oil enemas are sometimes very useful.

It is a great advantage to avoid, if possible, irritation by regular purges, even a weekly dose of salts. But these must be used if there is doubt about a sufficient evacuation.

In no case, as we warned in our previous paper, should a diverticulous area be massaged. Only recently a man was admitted in whom a quiescent hypertrophic area had been awaked into subacute and painful diverticulitis by a course of massage, given in ignorance of his state, with the object of curing the constipation.

Spriggs: Discussion on Diverticulitis

Attention to the general habits of the patient is almost as important as the local treatment of the bowel. One reads, or hears doctors say, that the treatment is this or that. But when you try to get people well you find that hardly anyone, certainly no modern man over 50, can be treated entirely out of a book. He is nearly always working or playing, or eating, drinking, smoking or sitting too much, and unless his life be regulated the local measures will not be enough.

The patient must be warned about the danger of obstruction. If it threatens, try careful treatment with enemata. By such means, and with continued care, colostomy may often be avoided for long periods, or indefinitely.

III.—No. 429.—A man of 55 had an attack of intestinal obstruction abroad which yielded to medical treatment. Four years later, aged 59, he came under my care with a tender tumour in the left iliac fossa and was found to be the subject of diverticulitis of the pelvic colon. He was also obese and suffering from mitral regurgitation and albuminuria. After two months' treatment he had lost 26½ lb., there was no albumin, and he felt well. On leaving he attended with reasonable care to the hygiene of the bowel, and needed no further special treatment for four years, when he returned, aged 63. It was now eight years since the threatened obstruction. The bowels were regular, and the tumour was no longer tender. After three weeks' treatment he left and went abroad again. Two years later, at 65, after an accident, there was bleeding from the bowel. About a year later, more than eleven years after the first attack, obstruction recurred, and a colostomy was done by a foreign surgeon, with cæcostomy, the latter being afterwards closed. On re-admission to Ruthin Castle, aged 68, the colostomy, which had no spur, was giving trouble. He washes out the lower bowel daily. A few weeks before, a formed motion had been passed per rectum.

This patient was a careful man, but he was abroad and away from close medical care for long periods. It appears probable that if he had been observed and advised, say every six months, the colostomy might have been postponed or avoided.

IV.—A man aged 63 had an attack of obstruction relieved by enemata. At the age of 65 he came under my care complaining of bouts of pain in the epigastrium and left iliac fossa every four weeks or so, with much flatulence. Severe diverticulitis of the pelvic colon was found, with spasm, but not much hypertrophic change. Treatment was carried out at home with success. Six years later, when aged 71, he returned, complaining of intense pain a fortnight before, worse after micturition, with headache. Actions, which had been regular for years with paraffin, had not been so lately. On examination there were many new diverticula, with stercoliths, and diverticulitis of the lower descending and pelvic colon. With six weeks' treatment the bowels became regular, and he went out apparently well.

Of the last fifty-eight cases, in thirty-four there were symptoms referable to diverticula. Nine of these cases we had not the opportunity of treating. Of the remaining twenty-five, sixteen patients received great benefit, eight were much relieved, and one was no better.

If these figures be added to those in our former paper, it will be found that out of 158 patients, eighty-seven complained of symptoms, of these seventy were treated, and fifty-two were completely or almost completely relieved; thirteen others received much benefit.

SURGICAL TREATMENT.

The surgery of obstruction from diverticulitis, of perforation of a pocket, of vesico-colic fistula, and of the last stage when suppuration has occurred in the bowel wall with involvement of surrounding structures, will be dealt with in detail by the able and experienced surgeons who are to take part in this discussion. These are necessary procedures at which the surgeon is an opportunist. He does what can be done. The technical details of such questions are of interest and importance, and each year advances are made; but you will not expect me to refer to them. What is in my mind and the minds of all of us, in the interest of our common art, is this: How far can we control the disease so that these operations of despair may be avoided?

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The surgical treatment of a perforated pocket we cannot expect to avoid. The accident happens and must be dealt with; indeed it occurs when diverticulitis, as I have defined it, is not present. An operation for obstruction from a gradually closing irremovable hypertrophic area which cannot be otherwise mitigated is also a necessity. It is much better to do it, however, at a time of choice, when regular X-ray observations have shown that the channel is narrowing and the bowel above dilating, and before the added dangers of actual obstruction have arrived.

If, however, the case is recognized, adequately treated and watched, with a barium enema every year for a simple diverticulosis, and every six months for diverticulitis, the severer complications are, in my experience, rare. The people who get into trouble are those whose cases have not been diagnosed, or who, after successful treatment, escape medical supervision and carry on with less and less attention to the bowel for years on end.

Radical surgical treatment is sometimes possible, and I look for fruitful discussion on this to-night. I have formerly pointed out that if there is pericolicitis excision is often neither possible nor safe; also that the disease tends to spread along the bowel, and removing one part would not necessarily prevent the spread. All this is true, but in practice hypertrophic inflammatory processes are generally confined to one area of bowel, and if that area can be successfully resected the patient is cured of diverticulitis [8], [10], [12], [13]. This has been done in a number of cases. Gerzowitsch [9] has collected 104 from the literature. Of these, 54 were cured, 7 died, and the result in 43 was not recorded. If the area can be radiographically defined, is not too low down, is reasonably free from involvement of surrounding structures, and if the symptoms persist in spite of careful treatment, the patient should, in my opinion, be offered exploration with a view to resection.

I look forward to the relief and cure of a much greater number of persons with this complaint as a result of closer co-operation between physicians and surgeons, and of such discussions as the one I have the honour to open to-night.

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Sir C. GORDON-WATSON, K.B.E., C.M.G.

INTRODUCTORY.

It is now seven years since this Sub-Section inaugurated a discussion on diverticulitis,¹ the first public discussion on this subject in London and perhaps in the world. Looking back on that very successful and crowded meeting, one remembers how some of us on the Council were a little apprehensive lest the subject might be somewhat obscure and the material somewhat scarce for a fruitful discussion.

¹ *Proceedings*, 1920, xiii (Sub-Sect. Proctology), pp. 55-98.

We welcome once more Dr. Spriggs. Seven years ago he came to us with radiographs that were a revelation. To-night he comes with those which testify to the great advances that have been made in radiology.

Some who were with us then are gone to-day; of those we do not forget our loyal friends, Hamilton Drummond and Graeme Anderson, who were such valuable contributors to our discussions.

ÆTIOLOGY.

Looking back on the years that have intervened, it is profitable to consider how far we have advanced in our knowledge of the pathology and treatment of diverticulitis.

I have already commented on the progress made in radiology, and it is very instructive to compare radiographs of cases taken then and now. This advance in radiology has enabled Dr. Spriggs, with his unique opportunities for the repeated study of any individual colon and the constant study of a collection of colons, to predict the birth of diverticulosis, a babe by dental sepsis—or spondylitis—out of irritable colon spasm. He has christened his babe the "pre-diverticular state." Radiographically, it might be called "Spriggs' spasm." Unfortunately it is only in institutions such as Duff House or the New Lodge Clinic that many opportunities arise for observations such as these, and consequently the volume of evidence in support of his findings must necessarily be scanty.

At our last discussion Dr. Spriggs emphasized the importance of drawing a distinction between colons with diverticula (diverticulosis) and colons with inflamed diverticula (diverticulitis). Since that time he has produced evidence to show that the formation of diverticula is often preceded by a sectional irritability of the colon which has distinctive features on the screen (the pre-diverticular state). If these observations can be definitely established I think we have advanced a long way, more especially if a connexion can be established between the irritable state of the colon and a primary septic focus existing in a tooth socket or elsewhere, which is a weak link in the chain at the present time.

The step from diverticulosis to diverticulitis consequent on faecal retention in the pockets and secondary inflammatory conditions has long been established and is clearly understood. As Maxwell Telling said at our last meeting, "Given the formation of multiple herniæ of the mucosa, every secondary process that occurs may be logically deduced *a priori* by general pathological comparison."

Shortly after Dr. Spriggs and Mr. Marxer published their paper on the pre-diverticular state, I was consulted by a medical man who complained of constant discomfort in the left iliac fossa, irregularity of the bowels and irritability of temper. Like many other professional brethren he had fears of cancer. A barium enema revealed a picture closely resembling one of Dr. Spriggs' illustrations of the P.D.S., and no diverticula were seen after evacuation of the enema. The patient was working very hard, taking very irregular meals and smoking innumerable cigarettes; he had taken no holiday for two years. A month's holiday, regular meals, fewer cigarettes and an abundance of paraffin, effected a complete cure. Recently I have observed a very similar picture in a barium enema after resection of the pelvic colon for carcinoma, which suggests that the normal peristalsis is disturbed behind the fibrous ring at the site of anastomosis. We know that cases of diverticulosis have often been noted above strictures, and this case may be an early phase of the same thing.

Sigmoid diverticulitis, like sigmoid stasis, is rarely met with in the prime of life and usually occurs in those who have passed the meridian of life. In the only case which I have met with in a young person (aged 26) the condition followed fibrous stricture of the rectum of many years' duration.

We all, I think, recognize that the pelvic colon is the seat of the election for diverticulitis. It is here, at any rate, that the stress of the inflammatory phenomena

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are seen, and although we may find diverticula along the whole length of the colon we find them more often in the pelvic colon alone and seldom if ever in the colon above and not also in the pelvic colon. Diverticulosis is for the most part symptomless except in the pelvic colon.

I am not one of those who hold that the natural intestinal angles are pathological kinks, but I think it may well be true that the recto-sigmoidal angle becomes a kink when the sigmoid is constantly overloaded with gas and fæces, and fails to evacuate regularly and completely into the rectum. Under these conditions irritation excites irregular spasm and contractions (the pre-diverticular state), which in due course give rise to herniæ through the weak spots of the muscular coat, where the vessels penetrate, in those who, no longer young and often no longer active, have allowed these muscles to become weakened by deposits of fat. Weak spots in a muscular wall must tend to yield to a frequently recurring increase in colon pressure due to irregular contraction from above, with some obstruction at the recto-sigmoidal junction below, and an excess of gas and fæces in between.

Nélaton described a sphincter at the recto-sigmoidal junction which normally relaxes to fill the rectum at the call of defæcation. This sphincter action thrown out of gear may be an additional factor in causing back pressure. That these diverticula are not simply passive herniæ through atrophied muscle is shown by the fact that diverticula are not met with, or at any rate rarely occur, in the thin-walled atonic and atrophied colons associated with general colon stasis. In several instances I have encountered extensive diverticulitis above both rectal carcinoma and carcinoma of the pelvic colon, and I suggest that stenosis causing back pressure is a factor in its causation in these cases.

To summarize my views on the ætiology of diverticulosis. I believe that the same factors which contribute to herniæ elsewhere come into play in the case of the colon, viz., increased pressure from within and diminished resistance of the wall. An overloaded and impeded sigmoid is mainly responsible for the former factor, and fatty infiltration and degeneration for the latter.

It is not so easy to explain diverticulosis in the colon above the sigmoid except as a backward extension of a back pressure process, unless we follow Dr. Spriggs in his pre-diverticular infective theory. The truth probably lies in a combination of these factors.

DIAGNOSIS.

Irregularities in the function of the colon present great difficulties in differential diagnosis in the consulting room, and in most instances we are dependent on the radiologist for a diagnosis of diverticulosis. As a rule the area involved is beyond the reach of the sigmoidoscope, or the sigmoidoscope cannot be passed to the full extent owing to adhesions. Yet the sigmoidoscope should always be employed, though with great care and gentleness. On three occasions I have been able to make a positive diagnosis by actually seeing the mouths of diverticula open during inflation.

If inflammation has occurred around diverticula, pain and discomfort with associated tenderness invariably occur, and frequently the inflamed area can be palpated through the abdominal wall. In advanced cases a typical sausage-shaped tumour can be felt. Irregular pyrexia, a moderate degree of leucocytosis and irritability of the bladder may help to confirm the diagnosis. All these are points in favour of inflammatory mischief rather than malignant disease.

Most observers lay stress on the absence of blood in the stools, but too much weight must not be attached to this point, as in three of my cases blood was occasionally noted.

Patients with diverticulitis are as a rule well covered and do not lose weight; there is no suggestion of the "shadow of malignancy" in their appearance. They

usually give a long history of capricious action of the bowels associated with pain and tenderness in the left iliac fossa, and sometimes down the leg, with intermittent periods of complete freedom from symptoms. These intermissions during the early phases are rather characteristic. The ebb and flow of chronic diverticular inflammation is doubtless dependent on variations in resistance and due to factors other than mechanical.

In the varying toxic states associated with oral sepsis there is, perhaps, some parallel. We know that periodic bouts of sciatica, lumbago, etc., are sometimes relieved by the discovery and cure of a septic pocket in a tooth or an accessory sinus. We may assume similar factors at work in connexion with the septic colon pockets to account for similar intermissions in their constitutional effects and corresponding local changes.

Although positive X-ray evidence of diverticula is conclusive, it should be noted that in cases of extreme fibrosis and stenosis the mouths of the pockets may be impervious to the barium solution, so that the diverticula are not shown. A specimen of mine, on the table to-night, illustrates this.

Negative X-ray evidence of diverticula, especially when stenosis is demonstrated, is not always conclusive evidence, though the irregular palisading of the contour of the pelvic colon, which does not vary while under screen observation, as Dr. Spriggs has emphasized, is very strong evidence, even though no pockets or crescents are visible after evacuation of the enema. I have called this the fir-cone appearance. It is definite evidence that fibrous tissue has destroyed the elasticity of the muscular coats.

THE SURGERY OF DIVERTICULITIS.

The cases with which surgeons have to deal belong to three main groups: (1) The acute inflammatory or emergency cases; (2) the chronic inflammatory, which may demand surgical treatment either for suppurative conditions, fistulae or obstructive symptoms; and (3) the hyperplastic or tumour cases which, whether obstructed or not, usually need surgical interference.

Of the acute cases I need say little, as the acute phenomena resemble so closely the varying acute conditions met with in connexion with the vermiform appendix. In these acute cases colostomy will often be necessary and should be carried out with as little disturbance as possible to the inflamed area; in most instances it will be necessary to employ the transverse colon for this purpose. I have on more than one occasion shut off the inflamed area from the general cavity of the peritoneum by suturing the great omentum to the region involved.

In the absence of a definite abscess active inflammation subsides with surprising rapidity after colostomy, and after a reasonable interval recovery may be so complete that the colostomy can be closed. I have had a case illustrating this in my wards during the past year. On the other hand, there is some danger of recurrence of symptoms after closure.

The chronic cases that do not respond to medical treatment are the most difficult to deal with. Frequent attacks of pain, constant difficulty and irregularity with the action of the bowels, troublesome flatulence and bouts of mild obstructive symptoms which do not respond to medical treatment, may demand surgical interference and an exploratory operation. The patient may resent the performance of colostomy unless unavoidable, and the surgeon may be in great difficulty to know what to do for the best. I am convinced that when in doubt colostomy should be advocated, because there is a great tendency to entire recovery when complete rest is secured and considerable risk of acute complications if nothing is done. In some instances appendicostomy and daily irrigation from above may suffice. The omentum should

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be utilized to protect dangerous areas by wrapping it round the bowel, and it may also be used to guard the bladder from adhesions.

If a vesico-colic fistula exists it should not be dealt with by plastic methods unless a temporary colostomy is also carried out.

In the third class of case, the hyperplastic, when fibrosis has led to stenosis, tumour formation and the mimicry of carcinoma, resection is the ideal treatment, but it is a dangerous proceeding unless the involved area is strictly localized and there are no active inflammatory signs.

I have recorded four cases of resection which have been carried out successfully, and in each instance I have employed different methods, according to the circumstances of the case, as follows:—

- (1) Primary resection (one stage method).
- (2) Lateral anastomosis with secondary resection (two stage method).
- (3) The Mikulicz method (three stage).
- (4) A modified three-stage method.

By means of the last-mentioned method I performed a lateral anastomosis within the abdomen, bringing the tumour outside the abdomen, which was subsequently removed with closure of the colostomy openings. The anastomosis functioned well, but the closed colostomy developed into a faecal fistula which has not yet been closed. In this case a diverticulum had ruptured into the left ovary, which was full of pus and the size of a golf ball. No diverticula were visible on the surface and the tumour was so hard that it was not possible to make a diagnosis until the specimen was cut into.

Two of these specimens are in the museum at St. Bartholomew's Hospital and two in that at St. Mark's Hospital.

I think we may say that our technique in colon resections has improved in recent years and with it our results, more especially with those who employ the so-called "aseptic" methods.

I would here emphasize that a primary resection is very seldom possible, and I believe very seldom advisable. The three-stage method is to my mind the only safe method when active inflammation is present; in some cases anastomosis is possible with exteriorization of the tumour and secondary excision; in others where stenosis predominates over inflammation, anastomosis between proximal and distal ends of the pelvic loop, when possible, may relieve all symptoms. While we aim at some form of resection as the ideal, we are far more often compelled to resort to colostomy.

In conclusion, I think I may say that we have learnt a great deal about the pathology and treatment of diverticulitis, but that we have much to learn about the aetiology and pathology of diverticulosis. If Dr. Spriggs and other physicians continue to advance our knowledge of the early phases of diverticulitis, I feel convinced that the cases which come into surgical hands will rapidly diminish in number.

I show two slides. One illustrates the pelvic colon of the medical man I have referred to, which cleared up by medical treatment, on the lines that Dr. Spriggs suggests.

The other shows the somewhat irritable state of the pelvic colon in the case I spoke about, in which the pelvic colon had been resected for carcinoma, and there were no symptoms. That may be a pre-diverticular condition, coming on in consequence of some narrowing at the site of anastomosis.

Dr. BERTRAM SHIRES.

Technique in X-ray examination of the colon has recently been discussed before this Sub-Section, so that I do not propose to dwell on it.

I approach the subject from the purely radiological standpoint, and therefore from the point of view of diverticula of the colon.

The X-ray examination is usually employed for differential diagnosis between diverticulitis and carcinoma. The method of choice is to administer a barium enema. The screen examination during the administration is of importance. A localized spasm with a temporary delay in the advance of the enema is of significance. A radiogram should be made to demonstrate this. Such spasm in a case of diverticulitis is as a rule quickly overcome by the gravity-fed enema. It may be necessary to increase the pressure, which is done by utilizing the bulb portion of a Higginson syringe between the douche can and the rectal tube. The spasm having relaxed or been overcome by the increased pressure, the colon may fill normally or show the extramural pockets indicative of diverticula. The colon is filled throughout if possible, though in a case of diverticulitis not infrequently the irritability of the lower colon and the consequent inability of the patient to retain the enema does not admit of this. In any case the important part of the examination occurs after evacuation of the enema. The diverticula are more apparent than in the barium-filled distended colon. Thereafter radiograms are made at intervals of days or weeks to illustrate the retentivity of the diverticula.

Effectiveness of treatment can be demonstrated by radiography at intervals after the administration of the enema. By this means there can be conclusively shown the effect, on the emptying the diverticula, of the administration of oil, whether by the mouth, or by the rectum, or simple lavage.

The X-ray appearances are typical, so that a mistake should rarely be made in diagnosis, provided an interval is allowed to elapse before concluding the examination. The radiograms made on the second or third day after administration of meal or enema are of the greatest importance. In the early stages of the meal, and sometimes of the enema, these diverticula do not fill the barium. Presumably they are already filled with faecal matter, but with a continuation of the examination some of the barium will mix with the faecal content. It is therefore important that a thorough lavage of the colon should be made before an X-ray examination. In such cases the portion of the bowel involved always presents a spastic appearance or some irregularity of the lumen which, while not characteristic, is suggestive, and should lead to further observation.

Late observations are again of importance in differential diagnosis from malignancy, as in the cases in which at the enema a ragged defect is seen in the sigmoid the forty-eight-hour film will show the extraluminal residues in the presence of diverticula.

My experience is that diverticula of the colon are seen rarely in hospital practice but very frequently in private practice. They are often disclosed during a routine gastro-intestinal examination in which there are no symptoms directly ascribable to them.

Lastly, the number of diverticula does not appear to be in any relation to the severity of the symptoms. (Lantern slides were shown to demonstrate this.)

Dr. DE MARTEL (Paris).

Diverticulitis is not rare, but a condition seldom diagnosed by physicians; for I have operated upon seven cases of diverticulitis: four males and three females; but none of these had previously been diagnosed as such.

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Case I.—Male, aged 72, whom I operated upon for incomplete intestinal obstruction. I performed a colostomy after having found a very hard tumour about the size of a small orange in the sigmoid. Immediately above the tumour, which was adherent to the parietal peritoneum, several diverticula containing hard fecal masses were seen.

The patient lived eight years without further intestinal trouble and died at 80 years of age from pneumonia.

Case II.—Male, aged 50, submitted to operation for acute appendicitis. I found the appendix perfectly healthy, but on the medial aspect of the caecum there was a long, gangrenous diverticulum which was perforated and contained hard fecal masses. I emptied the diverticulum and resected it; sutured in three places; covered with omentum; drained; patient recovered. The X-rays at a later date showed numerous diverticula in the sigmoid.

Case III.—Acute localized peritonitis with abscesses draining into the bladder, the patient's urine containing fecal masses. Incision and drainage of abscesses. The patient died from infection after several days.

Case IV.—Cancer of the sigmoid. I found a large, very adherent tumour which I removed. End-to-end anastomosis of the colon after caecostomy. Patient recovered. This was a case of diverticulitis. Opening up of the tumour revealed many large diverticula containing hard matter surrounded by tough fibrous tissue.

Case V.—Female, aged 61, who had a localized peritonitis in the left side of the pelvis. One abscess drained into the bladder, and gas and fecal matter appeared at the urethra. The tumour was easily palpable by rectal examination. Incision of the abscess and permanent colostomy of the transverse colon. Recovery with a persistence of fistula. The tumour had entirely disappeared, but the patient refused further treatment.

Cases VI and VII.—Intestinal tumours, mistaken for cancer, which had slipped back into the pouch of Douglas, where they were firmly adherent to the uterus and the left tube. In one of these cases the sigmoid was very long, and I was able to remove the tumour with the uterus to which it was attached. I performed an end-to-end anastomosis of the intestine after caecostomy. The patient recovered. In the other case I contented myself with doing a transverse colostomy and a cure resulted, the tumour, which had been very perceptible, having disappeared.

My experience with diverticulitis has* been very limited, but in my opinion this condition is very rarely diagnosed in its incipient stage, therefore all our efforts should be concentrated upon an early diagnosis, which would be of value in medical and surgical treatment. At the present time we are seldom called into consultation before the disease has progressed considerably and the infection has spread from the intestine to the neighbouring organs.

I think that the first step in this treatment is to perform an artificial anus at a considerable distance from the principal lesion, which, thus allowed to rest, diminishes in size, becomes less septic, is more amenable to surgical treatment and frequently disappears. In other cases we may attack the lesion itself when this is possible, and perform a colectomy, which is a difficult and grave operation; I also think that frequently we must be content with transverse colostomy, especially in the case of aged subjects.

M. VICTOR PAUCHET, M.D. (Paris).

I have operated in ten cases of diverticulitis, in all with a successful result. I do not include those of pericolic suppuration treated by simple incision, for the diagnosis was not ultimately confirmed in every case.

Four of these patients suffered from sigmoid flexure fistula, which closed after a left artificial anus had been made.

In the ten cases of diverticulitis I performed the following operations:—

- (a) Two simple excisions of the diverticula.
- (b) Four resections of the sigmoid flexure, following Lockhart-Mummery's method.
- (c) Four partial colectomies of the sigmoid flexure or of the descending colon with restoration of the continuity of the digestive tract, following the method of Mikulicz or Lardennois.

From the experience gained in performing these operations I have come to the conclusion that the method of surgical treatment depends almost entirely upon the nature of the particular case. I should like to draw your attention to one special case in particular, namely:—

The condition of a patient who has undergone a sigmoidectomy according to Lockhart-Mummery's method is as follows: he has a normal anus, but the upper end of the rectum is closed and the large intestine opens through an artificial anus into the iliac fossa.

If the case is one of cancer, or of obesity, or if the patient is old, this condition is negligible; but if the case is the consequence of a partial colectomy carried out for diverticulitis in a vigorous adult, we suggest the following two methods of restoring the continuity of the digestive tracts:—

(1) Extensive mobilization of the transverse colon and of the hepatic flexure, using Mayo's tube.

(2) Isolation of the iliac coil which replaces the functions of the descending colon.

I have twice been successful in the use of these methods:—

Unfortunately both the cases in which they were used were cancerous and the patients died from metastasis of the liver—one 13 months and the other 30 months respectively—after the operation. Consequently, I consider these methods unsuitable in cases of cancer, because the patients have to spend too long a period of their shortened life in the hands of the surgeon. But in cases of benign lesions, inflammatory tumours, or diverticulitis, this technique is recommended as suitable and should be employed as often as may be necessary.

ILLUSTRATIONS DESCRIBING METHODS OF OPERATION.

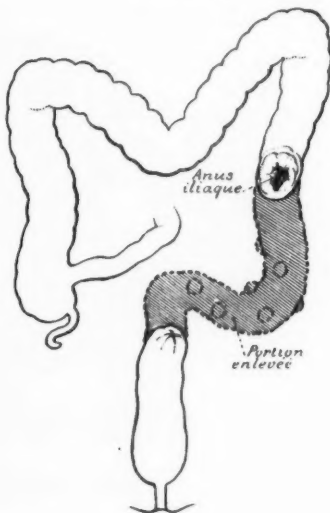


FIG. 1.

FIG. 1.—Excision of the sigmoid flexure Rectum closed and descending colon utilized as terminal anus.

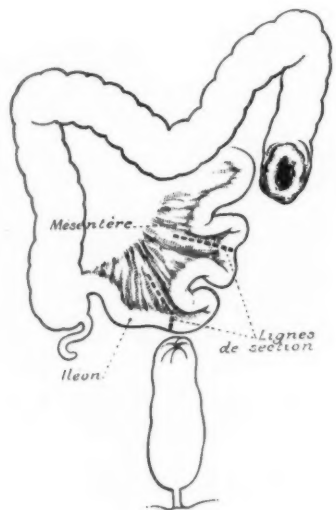


FIG. 2.

FIG. 2.—Restoration of the left colon by a loop of ileum.

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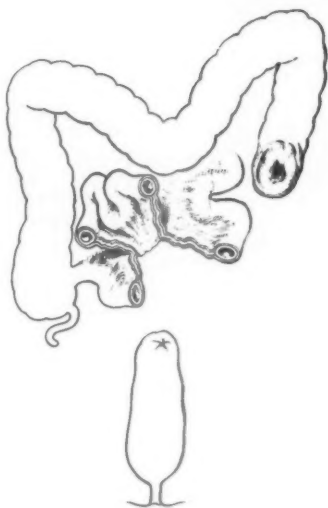


FIG. 3.

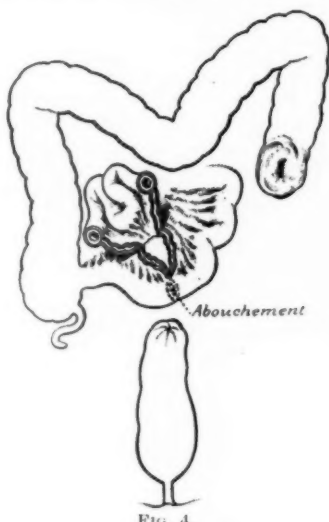


FIG. 4.

FIG. 3.—Restoration of the continuity of the transverse colon and the rectum. The surgeon chooses the lowest part of the ileum, and the coil of about 8 in. is separated between two sections. The mesenteric vessels should be preserved to provide the vascularization.

FIG. 4.—The ends of ileum are anastomosed end to end.

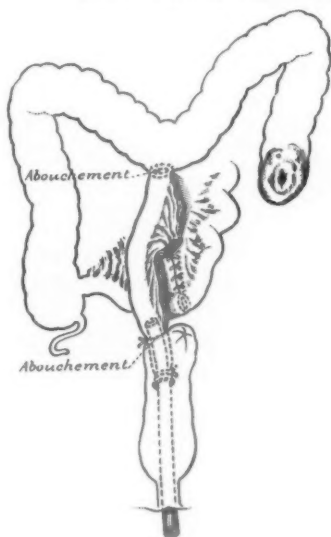


FIG. 5.

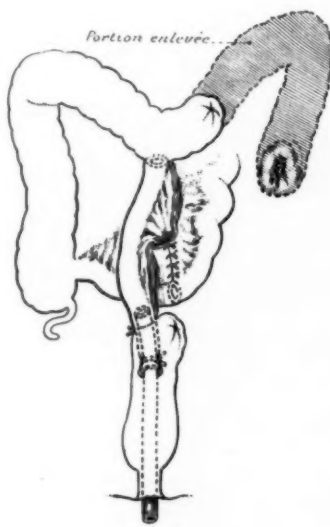


FIG. 6.

FIG. 5.—Anastomosis between isolated ileal coil and two parts of colon to secure the drainage of the bowels.

FIG. 6.—The left colon is replaced by a coil of the small intestine between the rectum and the transverse colon. Attention should be paid to the procedure of restoration. The splenic flexure of the colon excised.

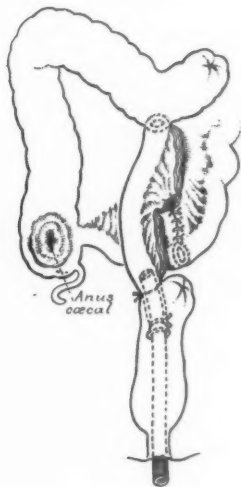


FIG. 7.

FIG. 7.—Appearance of the digestive tract after excision of the splenic flexure. The lower end of the ileal coil is fixed on an india-rubber tube.

Dr. A. P. CAWADIAS.

From a physio-pathological point of view it is desirable to have a clear understanding as to terminology, and to realize the distinction between diverticulosis and diverticulitis, this being very important. Diverticulosis is an anatomical condition. It means the presence of diverticula, that is of certain herniæ of the mucosa, on the description and mode of production of which I do not intend to speak. It is a condition which is relatively frequent and is not manifested by any symptoms. It is well to designate with special terms diverticula depending from various segments of the gut, and from that point of view the most frequent localization of diverticulosis are duodeno-diverticulosis and sigmoids-diverticulosis.

Diverticulitis signifies inflammation of these diverticula and we may also discriminate duodeno-diverticulitis, sigmoids-diverticulitis, etc. This last mentioned condition, sigmoids-diverticulitis, is the one principally under discussion. I have had the opportunity of examining post mortem, and after surgical operations, various cases of diverticulitis, and as a result of these observations I think three stages representing three distinct anatomical forms can be distinguished.

The first stage of sigmoids-diverticulitis may be called microscopical and latent. It is microscopical because to the naked eye the diverticulum appears healthy, as in simple diverticulosis. It does not contain fæces, but should they be present they can be easily emptied on slight pressure, and the diverticulum can easily be penetrated by the barium of the enema, giving the characteristic picture of simple diverticulosis. Microscopically, this diverticulum shows evidence of inflammation, lesions of the mucosa cells and pre-eminently an infiltration of round cells under the mucosa extending to the serosa.

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The second stage of diverticulitis represents anatomically a diverticulitis with imperfect obliteration of the diverticulum. In this case the diverticulum contains faecal material which may not fill the whole cavity, but which is emitted from it with some difficulty. Microscopically, round-cell infiltration in the direction of the serous envelope of the diverticula is more intense. This sigmoido-diverticulitis with imperfect obliteration of the diverticulum often gives rise to symptoms, such as tenderness in the left iliac fossa, also constipation, because abnormal reflexes originate in the inflamed diverticula. From a radiological point of view, the pictures obtained appear similar to those shown by Dr. Spriggs, as characterizing the stage of pre-diverticulosis.

The third stage of inflammation of the sigmoid diverticula is, anatomically, an obliterative sigmoido-diverticulitis. The diverticulum is completely obliterated, full of faecal material, which is often hard (coprolith), and cannot be expressed towards the lumen of the gut because this lumen is obliterated. Inflammatory lesions are very important and it is in these cases that we find the peridiverticular infiltrations and abscesses which are well described in the text-books. Clinically, this form of sigmoido-diverticulitis takes either an acute or a chronic course. The chronic course is that ably delineated by Dr. Spriggs. The acute course, which is rare, is well known to the surgeons who operate on these cases often diagnosed as those of left-sided appendicitis.

The comparison of these clinical observations made in Athens with those of Dr. Spriggs shows numerous points of analogy, and there is only a difference in the mode of expression. The condition which at the Evangelismos Hospital I call diverticulitis with imperfect obliteration is the same as described by Dr. Spriggs as prediverticulosis, and what I call obliterative diverticulitis is the syndrome for which Dr. Spriggs reserves the term diverticulitis. My terminology is based on the physio-pathology of the condition, and on the distinction between diverticulosis and diverticulitis, as made by de Quervain in 1914.

How do the diverticula become inflamed? It is necessary to consider both exo-infection and endo-infection. Exo-infection does not seem to play any important part in the causation of this condition. It is true that in all cases of diverticulitis infective foci are found, either in the teeth, the tonsils, or in other regions; but, on the other hand, such foci are so frequently present in people who have no diverticulitis and in those who have diverticulosis but no diverticulitis, that no great importance can be attached to these findings. What one has to fear is auto-infection. Wherever the passage of faeces is delayed in the gut and the faeces become impacted, the proteolytic organisms which are normal denizens of the gut multiply in number and increase in activity. This has been shown by many experiments at different dates, the most recent being those of Rettger, and Cheplin, of Yale. Before the actual appearance of diverticulitis there is always a stage of faecal stasis, at all events stasis in the diverticulum. Sir Charles Gordon-Watson has shown that diverticula may exist in various parts of the whole colon, but diverticulitis is most frequent in the sigmoid flexure, which is a common site for stasis. In the presence of faecal impaction, auto-infection takes place, and inflammation continues. One must apply to sigmoido-diverticulitis the theory of the closed cavity, in the way that it is applied in the case of appendicitis. It is true that this theory of Dieulafoy has encountered some opposition, but recent work has shown that there is a good deal of truth in it.

This conception of diverticulitis has resulted in the promulgation of certain new ideas as to segmentary colitis in the left colon. In the left colon there are two classes of inflammatory syndromes: diffuse, which extend in surface and not in depth, and segmentary, which are limited in surface but extend in depth. Among

these latter, the sphincteric proctitis of Strauss and the various forms of sphinctero-ampullar proctitis are well known. Formerly another form of segmentary or deep colitis was described as sigmoiditis; I myself have often made this diagnosis in hospital. But since my attention was drawn, in 1915, to diverticulitis and I have been able to collect material, I have not seen a case which I could regard as pure sigmoiditis. All cases which I have so diagnosed have been demonstrated as diverticulitis of the sigmoid region. This is easily understood, as the sigmoideum is an open canal, and in an open canal any infection tends to spread chiefly downwards, following the course of the faeces; and there is no tendency for it to go deeply. In order to penetrate deeply, it must be shut off from the general cavity of the gut, as is the case in diverticulitis. History repeats itself, as a similar change of view occurred in early days with respect to certain cases of segmentary colitis of the left colon which were considered to be typhlitis, but which have since been proved to be appendicitis. From a general pathological point of view the appendix is a diverticulum of the right colon.

With regard to the question of diagnosis, very difficult problems often arise in association with the acute left iliac fossa syndrome. I admit that in these acute cases it is always safer to diagnose acute appendicitis with left-sided symptoms, as that is the more frequent condition. But there is one sign which enables one to state that a case is appendicitis and not sigmoiditis. In three cases I have been struck by the importance of Rovsing's sign. The patients had an acute syndrome in the left iliac fossa, and the question of appendicitis or sigmoiditis was discussed. But on palpating the left iliac fossa, pain was elicited also in the right iliac fossa, and that settled the diagnosis, that it was appendicitis, not diverticulitis.

I have seen what great work has been done on this subject in this country. In 1913, Patel, speaking in Paris, said that, to the best of his knowledge, no case of diverticulitis had been diagnosed before operation or before post-mortem. When we compare that condition of affairs with what Dr. Spriggs has been able to show this evening, the great progress which has since been made at once becomes evident.

Mr. R. P. ROWLANDS

said that he would discuss a few points coming within his personal experience. He had learned what great success attended the medical treatment of this condition, largely owing to the researches of Dr. Hurst, with whom he had been associated in carrying out surgical measures in some severe and late cases. He had been much impressed by what could be done by early diagnosis and medical treatment. In some instances the obstruction seemed to be due to carcinoma, until radiography demonstrated diverticula. Then medical treatment generally overcame the obstruction and operation was deferred until a more favourable quiescent period. It was curious how seldom diverticulitis gave rise to complete and fatal obstruction.

He had known only one such case, and that was in a medical man who had had symptoms of this disease for eighteen years, and had several attacks of obstruction—on one or two occasions so severe that operation was advised, but always declined. Sir Humphry Rolleston advised him on one occasion to undergo an operation. Very late in the final attack the patient allowed a caecostomy to be performed, but it was too late.

His other cases included three of diffuse peritonitis due to this condition, two patients having died, and one having recovered after operation.

Another point to which he would refer was the association of growth and diverticulitis. This association constituted one of the greatest difficulties in diagnosis. In some of the cases he did not think a final conclusion could be reached without operation and microscopic section. He had come across several instances of these concurrent conditions.

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One doctor who had had symptoms for several years had been lulled into the belief that he had diverticulitis, and when he (the speaker) operated there was found carcinoma in addition. The growth was resected, but death took place a year later from recurrence.

It was necessary to dwell on the importance of the patient receiving both a bismuth meal and an opaque enema. Too much reliance was usually placed on one or the other. Both were necessary in order to give the fullest information concerning obstruction of the colon, and to demonstrate diverticula. Operation in these cases was often risky, because of the sepsis inseparable from this condition. The dangers of sepsis would be greatly diminished by careful preparation and particularly complete colostomy before operation.

With regard to his own personal experience of obstruction :

In 1909, he did a short-circuiting operation on a lady who had diverticulitis of the pelvic colon and descending colon—a very extensive tubular stenosis, causing chronic obstruction. He joined the ileum to the front wall of the rectum with some difficulty. She survived, and had lived until now, in fairly good health. At times, however, she had some diarrhoea, and the descending colon was still palpable as a rigid contracted tube.

He had resected in fourteen cases, with two deaths. One of the deaths was in a case of colico-vesical fistula, the end being brought about by sepsis. This was the one fatal case in three of the kind. In the other fatal case he made the mistake of resecting when there was too much inflammation, and in not using the tube resection method described by Rutherford Morison, Lockhart-Mummery, and Balfour.

For safety, preliminary transverse colostomy was preferable to cæcostomy. It was essential to divert the faeces completely in order to secure the best results, but colostomy was not necessary in the earlier cases, operated upon during a quiescent period.

It might seem strange to some, but in four out of his fourteen cases of resection he did not recognize the exact condition until he had completed the resection for supposed carcinoma.

His first case came to him in 1911 from a distinguished physician with the confident diagnosis of growth of the pelvic colon. A lump could easily be felt. He (the speaker) resected what he thought was a carcinoma of the pelvic colon, but on opening the bowel afterwards he found no cancer, but diverticulitis, with a large mass of inflamed tissues with small abscesses around diverticula in the pelvic mesocolon, pressing upon and obstructing the colon.

He had had three cases of the kind since then. It would thus be seen how great the difficulty sometimes was in making a diagnosis, even at operation, and what a debt of gratitude was due to the radiologist for making a diagnosis possible before the abdomen was opened.

Mr. TURNER WARWICK

said he had nothing to add to the discussion on the ætiology and treatment of diverticulitis, but he had met with two cases which he thought were worth bringing to notice.

Case I., of which the specimen was exhibited on the table, was that of acute perforation of a diverticulum in the cæcum at the point where it joined the ascending colon. A diverticulum in that situation was, he thought, fairly rare. This case was associated with carcinoma of the pelvic colon, and apparently the perforation occurred as the patient was walking along the street, and when brought to hospital a few days later he was in a moribund condition. All that could be done was to perform a post-mortem examination, and that revealed the perforation in the cæcum and the carcinoma in the pelvic colon. The specimen also showed melanosis of the ascending colon, which was also of some interest.

Case II.—The patient was operated upon in the Gynaecological Department, for what was considered to be pelvic inflammation. An abscess associated with a diverticulum of the

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pelvic colon was drained. He (the speaker) was called in three weeks later to explore an empyema of the chest. On opening the chest, he found pus containing granules. The patient eventually died, and it turned out that the condition was a diverticulum infected with actinomycosis; the infection had spread up the left side of the abdomen, and produced actinomycosis of the pleura.

The association of actinomycosis with appendicitis was comparatively rare, but it was occasionally encountered. He accepted the theory that the actinomyces existed in the bowel usually as a non-pathogenic and perhaps even a normal inhabitant. It was not known under what conditions it invaded the bowel wall. If it were going to attack any portion of the bowel, he did not see why it should not occasionally attack the wall of a diverticulum. Indeed the conditions there seemed very favourable for the invasion.

Mr. P. LOCKHART-MUMMERY (President).

The last time we had a discussion on diverticulitis our knowledge of the condition might have been said to have been in its infancy and interest centred chiefly upon the pathology of the disease and its treatment. Since then our knowledge has increased considerably and there has been an opportunity afforded of tracing ultimate results of cases treated in various ways and of seeing what has been the ultimate fate of those cases. I think the chief interest of to-day's discussion centres round the progress of patients in whom diverticula have developed and who have been watched over a period of years, and in the results, more particularly the remote results of surgical and medical treatment. We have to remember that the cases of diverticulitis which are presented to the surgeon are of a much more advanced and severe character as a rule than those which come under the observation of a physician such as Dr. Spriggs.

Most of the cases met with by the surgeon, at any rate if I may draw conclusions from my own experience, are so serious that some form of surgical interference is necessary if we are to save the patient from disaster. I am prepared to admit that if these cases had been treated efficiently on medical lines at an early period in the development of the disease surgical interference in many cases might have been avoided. Early recognition of the disease is of the utmost importance, but if symptoms of chronic obstruction associated with the formation of a tumour and chronic sepsis are already present, I believe that immediate surgical interference is indicated and that palliative measures at this stage will more than probably result in a disaster from which it will be difficult, if not impossible, for the surgeon to extricate the patient. As in so many other diseases, one sees that the bad results following operation are almost invariably in those cases which have been submitted to operation at a too advanced stage.

As regards the subjects of discussion, I cannot agree with Dr. Spriggs that diverticula form as a result of an inflammatory condition of the colon wall. It does not seem to me that the evidence is convincing in favour of an inflammatory origin. It seems much more probable that in its earliest stages the diverticula arise as pure pressure sacs in a weakened colon wall.

As regards treatment, I think that if the condition is detected before serious septic complications have arisen and while the disease is still confined to the colon wall most patients can be kept in good health if they will lead a "paraffin life." After septic complications have arisen operation should not be delayed, and as a rule treatment will involve one of three procedures: (1) resection, (2) separation of adhesions, and (3) an omental graft—or colostomy.

Resection yields admirable results, but is only possible in a few cases where there is sufficient length of bowel below the area of disease.

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I have had very good results from carefully freeing the adhesions and wrapping the affected area well up in omentum and shifting it away from the lower pelvis,—where it is in contact with the bladder—into the left iliac fossa. I have three patients, all of whom had abscesses, who have done very well and have had no symptoms over periods of six to seven years.



Mr. Lockhart-Mummery's specimen from case of diverticulitis treated by resection and end-to-end anastomosis. The specimen shows the outside of the colon after the fat has been dissected off with some of the diverticula laid open, showing the dense fibrous tissue forming around. Patient well two years later.

Colostomy is the safest procedure, but should not be left till too late. I have seen three cases in which secondary carcinoma developed in the septic sinuses seven years afterwards.

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Mr. LOCKHART-MUMMERY exhibited by means of the epidiascope a list of fifty cases with which he had had to deal. In fourteen cases colostomy had been done. There was short-circuiting in two. They were more or less satisfactory. There was no mortality, but the patients had some trouble afterwards. The next cases were those in which the adhesions had been freed, the tumour had been lifted out from the bottom of the pelvis, and the whole tumour, with the omentum rolled round it, stitched in position. He had had five of those cases, and they had done very well, some of them remaining in good health five or six years afterwards; they were leading a "paraffin" life. This was a good method when the surgeon wished to avoid doing colostomy and was unable to perform resection. Simple drainage was done in three cases of general peritonitis, with one death. Excision of diverticulum, one case. Exploratory laparotomy and left alone, three. Resection and anastomosis, nine cases, with two deaths.

The next table he exhibited showed the after-results of some of the cases. Of colostomy cases, seven were operated upon before there were any septic sinuses or abscesses. In eight it had been carried out after perforations of the bladder or when a sinus had formed on to the abdominal wall. Three of those patients died from carcinoma of the sinuses afterwards; i.e., one eight years afterwards, one three years afterwards, one two years later. He thought there was no doubt that the carcinoma was secondary to the sinus condition. The cases in which resection and anastomosis were performed had all done well; the patients had recovered and were leading normal lives.

He then showed several slides. The first was that of a patient, aged 70, who had a large tumour and obstruction. There was diverticulitis. He (the speaker) resected the tumour and made an end-to-end junction, followed by complete recovery. The specimen itself was on the table (see fig. p. 87).

The next patient had a large tumour, and this was treated by wrapping it in omentum. The photographs now shown were taken three years afterwards. Though the patient was at present without symptoms, the condition was still persisting, and an extension of the diverticula had occurred.

The next slide showed a specimen which was resected, with the uterus and left tube from a patient who had chronic obstruction. She was well two years later.

The next specimen showed a dense mass of fibrous tissue, composing a tumour of the pelvic colon resected with the uterus and end-to-end junction. This patient had remained well since.

The patient concerned in the next slide was not operated upon, but was put upon paraffin and medical treatment, with the result that the condition subsided, and he had not had any symptoms since the first photograph was taken in 1925. The next photograph, taken a year later, showed a well-marked increase in diverticula, so that it looked as though he must be operated upon eventually, though there were not yet any symptoms to justify this.

The last slide showed the interesting condition of diverticula of the caecum.

Dr. SPRIGGS (in reply)

said that Sir Charles Gordon-Watson had mentioned constipation. In the former paper he and his colleague (Mr. Marxer) said that they assumed constipation to be an important factor, and yet their patients who were examined radiologically, and found to have diverticulosis, were no more constipated than were other patients. But the controls were hospital controls. He believed that it was not known what proportion of ordinary people showed constipation. In their series of fifty cases, nearly half of the patients were constipated, i.e., radiologically speaking. Some people complained that they were constipated when there was no delay in the bowel. This again emphasized the need for a large number of normal controls, but, so far, these were not forthcoming.

In reply to a remark made by Dr. Shires he (Dr. Spriggs), said that he had refrained from discussing on the practical aspect of radiology.

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He was much interested in the excellent picture of the stricture case. In a certain number of cases of diverticulosis these strictures assumed that appearance—namely, that of a broad, thick, curved tube.

Dr. Cawadias had alluded to the definition of diverticulitis, and had discussed the condition in the earlier stages. He (Dr. Cawadias) was logically right; if one diverticulum irritated the peritoneum and caused pain, it was right to term that condition diverticulitis. But in practice it could not be regarded as such, because it was possible to allay the pain and discomfort by giving paraffin, and the patient would be able to carry on well for years without having suffered from what could properly be called diverticulitis from the clinical, radiological and pathological points of view.

He (Dr. Spriggs) was also interested in Mr. Rowlands' remarks about the association of new growth and diverticulitis. In the first hundred cases of diverticulitis referred to in the paper, carcinoma was no commoner than in the average population in hospital. But it was agreed that any source of irritation produced a pre-disposition to carcinoma, and in the literature the general view was expressed—with which he concurred—that people with diverticulitis were probably more liable to develop carcinoma than were others.

He agreed that, as a rule, the use of enemata should be the routine practice, but there were cases in which one had to be content with a meal, and that supplied all the necessary information.

The figures which the President (Mr. Lockhart-Mummery) had given were most eloquent, and constituted a valuable contribution to the discussion.

Mr. LOCKHART-MUMMERY (President)

said he was sure the Section would agree with him in thanking M. Victor Pauchet and Dr. de Martel for having come over from Paris to attend this meeting. Members were delighted to see him, and he hoped it would mean a beginning of the practice of French surgeons attending meetings in London and surgeons from this country attending meetings in the French capital. The advantages of resorting to meetings in other countries could not well be over-estimated.

He also expressed the Section's thanks to Mr. Grey Turner, who, though he was not himself able to be present, had sent a series of beautiful specimens from Newcastle-on-Tyne for exhibition.

Solitary Diverticulum of Sigmoid.**By CECIL W. ROWNTREE, F.R.C.S.**

THE patient, a man aged 45, suffered from constipation and abdominal pain for ten years. The photograph (see fig., p. 90) was taken in May, 1926. This was not done after a bismuth meal, but it is probable that a bismuth mixture had been administered at an earlier date.

I saw the patient for the first time after the photograph had been taken, and as no conclusion could be arrived at as to the nature of the shadow the abdomen was explored and a large, smooth, thin-walled diverticulum was found to be projecting from the antero-lateral wall of the sigmoid.

The inspissated contents were expressed into the bowel and the diverticulum was excised. No evidence of any further diverticula could be discovered.

The patient made a good recovery. He has put on weight and is now free from symptoms.



Solitary diverticulum of sigmoid.

Section of Therapeutics and Pharmacology.

President—Dr. GEORGE GRAHAM.

Action of Lobeline.

By F. R. CURTIS, M.B., and SAMSON WRIGHT, M.D.

(ABSTRACT.)¹

LOBELINE is a pure crystalline compound obtained from *Lobelia inflata* (Indian tobacco), with the empirical formula $C_{23}H_{29}O_2N$. Since its isolation by Weiland in 1918, lobeline has been coming into clinical use, and the authors have therefore undertaken a re-investigation of its pharmacology. The experimental findings in the case of the heart are as follows: The initial effect appears to be a slowing of the heart, the auricle particularly being affected, and this cardiac inhibition usually causes a fall in the blood-pressure. If the heart is in an enfeebled state this initial depression may arrest it altogether, but usually there is present a secondary effect, in which the heart rate returns to normal, and may accelerate still further. The effects on the heart appear to be complex in character, consisting of initial stimulation both of the vagus nucleus in the medulla and the ganglion cells of the vagus in the nodes of the heart. These cells are later paralysed, and in addition lobeline has also a direct poisonous action on the heart muscle. The effect of lobeline on the blood-pressure consists in an initial fall, due probably to cardiac inhibition, followed by a marked rise, after which the blood-pressure returns to normal, or, if larger doses are used, even below this. Lobeline appears to act by first stimulating and then paralysing the ganglia along the course of the vasomotor nerves. Lobeline markedly stimulates the respiratory centre, causing a considerable increase in the pulmonary ventilation. The doses required to produce such effects, however, also give rise to the effects on the circulation already described. It appears that the drug lowers the threshold of the respiratory centre to carbon dioxide. The influence of lobeline was also studied in narcotized animals. In animals under ether anaesthesia, pushed until the breathing had become slow and feeble, recovery was definitely more speedy if lobeline was used than in the control animals allowed to recover unaided. In animals narcotized by morphine, lobeline increases the rate of respiration and leads to adequate ventilation. If the respiratory centre is completely paralysed by morphine lobeline is much less effective, possibly because of the low blood-pressure. Lobeline produces initial constriction of the bronchi in some animals. Vomiting, micturition and defaecation may occur when large doses are employed. Lobeline is shown to be a powerful respiratory stimulant, but only in doses which produce other effects, and it should be cautiously used in the case of patients with an enfeebled myocardium. It may be useful in cases of sudden respiratory failure from any cause, and would, perhaps, be more effective if combined with some cardiac stimulant. The authors, arguing from the dosage used in animal experiments, suggest that a dose of 10 mgm., injected intravenously, may be found effective in the human subject.

¹ Published in full in the *Lancet*, December 18, 1926, p. 1255.

Curtis and Wright: *Action of Lobeline*

Sir WILLIAM WILLCOX said that the clear demonstration by the authors of the physiological action of lobeline was the best guide to the clinical use of the drug. He had used the drug successfully in cases of urgent dyspnoea due to pressure on the bronchi. In one case there was a malignant growth at the bifurcation of the bronchi, in which most urgent attacks of dyspnoea occurred. Lobeline in doses of $\frac{1}{20}$ gr. gave great relief on several occasions. The dyspnoea was relieved almost at once, and sleep followed the administration of the drug. He had used the drug in cases of asthma but did not find the beneficial effect equal to that of adrenalin.

He had given lobeline in doses of $\frac{1}{20}$ gr. in a case of persistent hiccough, where other remedies had failed. Instant relief followed. In another case the drug had had little effect. The beneficial use of lobeline in cases of coal-gas poisoning and in cases of morphine poisoning was well known.

Section of Tropical Diseases and Parasitology.

The Oöcysts of a Coccidium in the Fæces of Laboratory and Wild Rats.

By M. A. AZIM, D.M. & S.Cairo, D.T.M. & H.Lond.

From the Department of Protozoology, London School of Hygiene and Tropical Medicine.

Presented by J. G. THOMSON, M.A., M.B., Ch.B.

(Director of Protozoology, London School of Hygiene and Tropical Medicine.)

SOURCE OF THE MATERIAL.

DURING an examination of the fæces of tame white rats it was found that a very high percentage were passing oöcysts of an *Eimeria*. Similar oöcysts were found in four wild rats caught in the London Docks. They were, as a rule, scanty in numbers, and it was noted that infections were commoner in young rats. Further, it seemed an important fact that the infections were of an extremely transient character, tending to disappear gradually and return later. As the infections were not heavy at any time the finding of oöcysts was not always easy, and in many instances they have been overlooked entirely. In older rats infections were less frequent, and most adults were, as far as microscopical examination of the fæces is concerned, entirely negative. This would suggest an acquired immunity. Several rats were killed and their intestines examined, but asexual forms were never demonstrated in the epithelium of the gut. No naked-eye lesions were detected to aid in the examination of special portions of the intestine, but there is no reason to doubt that infection actually was present, and was simply overlooked. On the other hand it has to be borne in mind that oöcysts recovered from any specimen of fæces simply may have been ingested in the fodder and pass unchanged through the rat's alimentary canal (*vide* Thomson and Robertson, 1926). These points will be discussed below.

PREVIOUS OBSERVATIONS ON COCCIDIOSIS IN RATS.

A survey of the literature presents difficulties in that many of the previous accounts are incomplete, and in one important instance, viz., the paper by Ohira, it has been impossible to obtain the original reference in this country. No English observer has reported the presence of the oöcysts of an *Eimeria* in rats. The first account in the literature is that of Eimer (1870), who describes the process of schizogony of *Eimeria falciformis* in the mouse, at the same time stating that a similar parasite occurred in rats. Grassi (1881) noted coccidiosis in rats, and found it necessary to disinfect the cages of infected animals to prevent infection of fresh stock. In 1904 Wasilewsky reported that Nissle had found *Eimeria* in a black rat in Berlin, but he gave no reference to the date or publication. Ohira (1912) published an account in Japan of a new coccidian found in a rat, which he considered to be a distinct species, and named it *Eimeria miyairii*. This paper, unfortunately, it has not been possible to consult, and only an inefficient reference has been made to it by Fukuhara (1913) who gave no measurements of the oöcysts, and an inadequate description of the developmental stages in the gut.

Coccidiosis of rats was described by Carrazi (1913), who gave an account of an infection of the liver, but further investigations showed he was mistaken, and that he had confused the ova of *Trichocephalus* with the oöcysts of a coccidian. In

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the same year Reich (1913) gave a full account of *Eimeria falciformis* in the mouse, and considered it as identical to that found by Grassi (1881) in the rat. Nöller (1920), however, failed to infect rats with the fully developed oöcysts of *Eimeria falciformis*. Rudovsky (1921) reported coccidiosis in thirty-five young rats, and came to the conclusion that the organism was identical with that found in the mouse. The same observer stated that he had encountered *Eimeria stiedæ* in four rats. These species he differentiated by their variations in size, shape and sporogenic cycle, which he did not describe in detail. He found the oöcysts in the forage, and considered the rat as a carrier of rabbit coccidiosis. He assumed he had proved this by infecting a young rabbit from the fæces of a rat, which was supposed to contain the oöcysts of *Eimeria stiedæ*. Finally, Dieben (1924) assumed that the rat coccidian was strictly specific in that he failed to transmit it to mice, guinea-pigs and rabbits. He succeeded in transmitting the rat coccidian to *Rattus rattus* and *Rattus norvegicus* and from both these hosts to white rats. He described the asexual development in the small intestine as far down as the cæcum, and named the parasite *Eimeria nieschulzi*. Experiments made by this worker to infect rats with *Eimeria stiedæ* gave negative results.

DESCRIPTION OF THE OÖCYSTS AS FOUND IN THE FÆCES OF RATS IN ENGLAND.

The oöcysts vary in shape. The majority are ovoid or egg-shaped, having one pole narrower than the other (*vide* figs. 1, 2, and 3). Others tend to be more spherical, especially those in which development is more advanced (*vide* figs. 4, 5, and 6). The outer wall of the oöcyst is approximately 0.6 micron in thickness,

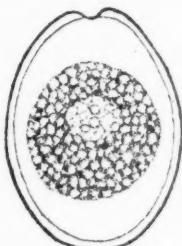


FIG. 1.

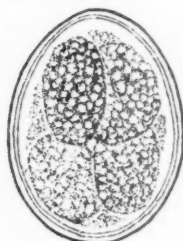


FIG. 2.

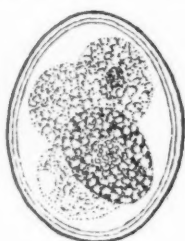


FIG. 3.

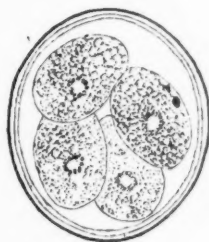


FIG. 4.

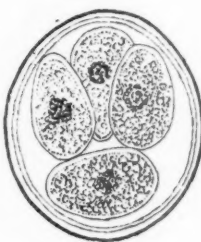


FIG. 5.

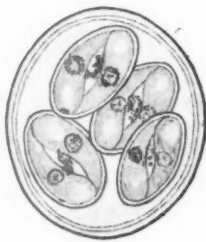
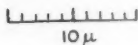


FIG. 6.



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and inside this is the usual thin membrane lining, as it were, the outer wall (*vide* figs. 2, 3, 4, 5 and 6). The micropyle is seen in some individuals situated at the more tapering pole (*vide* fig. 1). The protoplasmic contents of undeveloped cysts consist of greenish, highly refractile granules, in the centre of which is a single vesicular nucleus. At ordinary room temperature development is completed in six or seven days. Four oval sporocysts, each containing two sporozoites, form the final stage of development. The length of the sporocysts varied from 8.5 microns to 10.5 microns, and the breadth from 6 microns to 6.8 microns. No oöcystic residuum was noted, but the usual residual globules were present in the sporocysts (*vide* fig. 6). The sporozoites are blunt at one end and taper at the other. The nucleus, vesicular in type, is situated in an almost central position, and there is a clear vacuole towards the blunt end (*vide* fig. 6). So far, all attempts to demonstrate a development in the intestinal epithelium of the rats have failed. This is either due to the infection being extremely small or simply to the fact that the oöcysts are pseudoparasites in the sense that they are swallowed in the food and are passed, like foreign bodies, in the faeces. That the latter alternative is improbable seems likely to be the case since the infection was found in a very large number of white laboratory rats, especially the younger ones, and also in four wild rats, which, as they were trapped in the London Docks, came from a different area. All the oöcysts passed were in an undeveloped state, but matured later, which is very suggestive of it being a true infection and not merely a case of adventitious passage through the alimentary canal. The fodder consisted of bread, bran, oats and cabbage, and the chances of its being contaminated either by the faeces of mice or rabbits was very small.

DISCUSSION.

Early observers evidently considered that the *Eimeria* found in rats was identical with that found in mice, but Ohira (1912) named that found by him in rats *Eimeria miyairii*. Dieben (1924) noted Ohira's paper and specific name, and, in spite of the fact that he failed to consult Ohira's original, named his species *Eimeria nieschulzi*. At present it is impossible without direct reference to Ohira's paper to determine definitely the correct specific name for the coccidian in rats. Dieben brought forward some experimental evidence that the rat coccidian was specific to rats, and could not be transmitted to mice, guinea-pigs or rabbits. He succeeded, on the other hand, in transmitting the *Eimeria* to *Rattus rattus* and *Rattus norvegicus*, and from both these species to tame white rats. Rudovsky's claim of finding *Eimeria stiedæ* in rats, and in succeeding in the transmission of the oöcysts of this species to a young rabbit, is interesting in view of the recent observations of Thomson and Robertson (1926) who found that oöcysts of certain fish coccidia could pass unchanged through the human intestine. In collaboration with Miss M. J. Triffitt the following experiment was carried out. A white rat was fed on fully developed oöcysts of *Eimeria stiedæ*, and another on the oöcysts of *Eimeria perforans*. Both rats examined twenty-four hours later showed unaltered oöcysts in their faeces. Further daily examinations failed to show oöcysts and the rats remained healthy. Post-mortem examinations were also negative. It is thus obvious that oöcysts of the rabbit coccidian swallowed by rats might be transmitted through this host and infect fresh rabbits. Owing to the great variations in the dimensions of the oöcysts in rats, mice and rabbits it is not possible at present to differentiate these species on morphological grounds alone. It is necessary, therefore, that great care be taken before it is assumed that the species are distinct, and it seems that further experimental work might be carried out advantageously by cross infections of rats, mice, guinea-pigs and rabbits. For purposes of comparison a table is appended below of

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the measurements of the oöcysts (*Eimeria stiedæ*, *Eimeria perforans*, *Eimeria falciformis* and the *Eimeria* found in rats) given by various authors.

COMPARISON OF THE MEASUREMENTS OF THE OÖCYSTS OF THE RABBIT, MOUSE AND RAT.

Observer	Parasite	Length microns	Breadth microns	Host
Reichenow, 1921 ...	<i>Eimeria stiedæ</i> ...	20 to 40 ...	16 to 25 ...	Rabbit
Waworuntu, 1924 ...	" " ...	28 to 44 ...	21 to 30 ...	"
Pérard, 1924 ...	" " ...	33 to 43 ...	18 to 30 ...	"
Reichenow, 1921 ...	<i>Eimeria perforans</i> ...	16 to 29 ...	12 to 16 ...	"
Waworuntu, 1924 ...	" " ...	15 to 30 ...	11 to 18 ...	"
Pérard, 1924 ...	" " ...	25.5 ...	15.5 ...	"
Reich, 1913 ...	<i>Eimeria falciformis</i> ...	16 to 21 ...	11 to 17 ...	Mouse
Neveu-Lemaire, 1912 ...	" " ...	26 ...	16 ...	"
Clarke, 1895 ...	" " ...	18 ...	18 ...	"
Author, 1926 ...	" " ...	17.5 to 25.9 ...	16 to 18 ...	"
Rudovsky, 1921 ...	<i>Eimeria</i> found in rats ...	20 to 23 ...	15 to 18 ...	Rat
Dieben, 1924 ...	" " ...	18 to 26 ...	14 to 20 ...	"
Author, 1926 ...	" " ...	11.7 to 25.9 ...	11.7 to 19.3 ...	"

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A Spirochætic Infection with Necrosis and Perforation of Ileum.

By W. BROUGHTON-ALCOCK, M.B.

THE case to be described presents among other interesting features that of apparent great rarity, as no previous description of comparable lesions in the ileum due to similar ætiological factors can be traced in the literature. It is a general observation that the alimentary canal from the lower end of the pharynx to the cæcum shows a marked resistance to infectivity with any spirochæte, despite the frequency with which they are swallowed in water, and found in normal and particularly in diseased conditions of the buccal area. This is in striking contrast to the extension of buccal and pharyngeal infections with spirochætes to tooth pockets, to the antra and neighbouring sinuses, and also to the conditions of tracheal and bronchial spirochætosis.

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The clinical history is unfortunately sparse. The patient was a man, aged 37, in good health until August, 1917, when he contracted gonorrhœa, which was early and well treated and considered cured after six weeks. This is mentioned because one may consider an association of this condition with the arthritis and myositis which developed later. Unfortunately no information regarding the state of his teeth was available, but the subsequent history obtained pointed to their being defective also at this time, and I think to their being the more probable causal septic focus.

Towards the end of 1917 he was treated in his billet for myalgia, influenza and debility. Two years later he was admitted to hospital in Italy suffering from diarrhœa, which was considered due to poor digestion of food. Discharged cured after eleven days. No available history of state of teeth on either occasion save a note that nine teeth were extracted in 1914 and five later. In February, 1920, he was again admitted to hospital, suffering from debility, dyspepsia, myalgia and dental caries. He had but one molar (left) in upper jaw, and one molar (right) in lower jaw. Carious jaws, incisors and canines present in both. The knee- and shoulder-joints creaked on movement; back movements stiff, laboured and painful; tachycardia marked with some dyspnoea; urine normal. Again in hospital in January, 1924; similar condition but worse in degree; teeth deficient, tongue furred, larynx congested, uvula elongated and relaxed; aortic second sound accentuated; urine normal. When seen again in February and October, 1925, there appeared slight amelioration of the condition noted a year previously, but no note was made on the state of the mouth and pharynx.

He was apparently able to carry on his work and did so until August 23, 1926, when there was an acute exacerbation of his rheumatic condition, both knees and right ankle being swollen, painful and tender; pain also in both forearms, the left wrist being recently swollen. Eight days later he was admitted to hospital very ill and with a history of acute diarrhœa with blood in motions. The blood may have been in part or wholly explained by a large, soft flaccid external hæmorrhoid; frequent vomiting; abdomen tender at all parts, full but not rigid. The stools were loose, dark coloured and contained numerous small clots. The examination of a specimen showed blood-stained mucus containing shed epithelial cells, no pus and no protozoon; and no organism of the *enterica* or *dysentericæ* groups was isolated. Urine, specific gravity 1026, acid, loaded with albumin, no glucose. General condition poor; tongue furred and dry; chest fully resonant; breathing sounds harsh, no adventitious sounds; heart, nothing abnormal. The diarrhœa and vomiting ceased under treatment, and patient said he felt better on September 3, 1926. Weakness, however, continued, and death took place three days later. Temperature on admission to hospital 97° F.; it remained between 97° F. and 98° F. during the first five days, the pulse ranging between 96 and 102. On the sixth day the temperature fell to 96° F. and remained below normal until death on the seventh day, the pulse rising with this fall of temperature to 110 and 112 per minute.

Autopsy four hours after death showed the abdomen distended and containing free fluid; coils of small intestine intensely injected, dark red, matted with recent soft adhesions adherent to lower part of anterior abdominal wall and down in pelvis; parts of the bowel almost gangrenous. Localized abscess between coils of ileum and ascending colon. Appendix free, not inflamed and not involved in the peritonitis. Several ulcers in the bowel up to five to six feet from the ileo-cæcal valve; some of these ulcers had sloughs attached. It is presumed that there had been a perforation of one of the ulcers to produce the abscess. Kidneys large and deeply congested; capsules stripped easily. No other abnormality found except a scarred adherent left apex of lung.

Examination of Specimens.

Kidney shows partial tubular nephritis with desquamation of epithelium in some of the tubules, more marked in the convoluted portions.

A piece of ileum taken from about six feet above the ileo-cæcal valve was sent in formol saline for pathological investigation. One ulcer simulated that of a second-week typhoid infection, another was but a dark irregular necrotic patch. Two others were less congested or necrosed, of irregular raised outline and granular base and were formed in a transverse position. Each had an exudate on its surface. The peritoneal surface at the back of the ulcers showed deep red or darkened patches and no fibrinous exudate attached. Sections made showed that the ulcers were not of Peyer's patches as anticipated and all exhibited a rapid tendency to necrosis. The second ulcer was permeable and capable of leaking and infecting

the peritoneal cavity and in this the necrosis was very marked. The peritoneal lining of all ulcers showed streptococci in diplococcal form and only a rare spirochæte in necrotic tissue. The inner surface showed destruction of mucous membrane, partial or complete, and masses of the infecting organisms, *Streptococcus* and the spirochæte, the former practically free from the exudate, in which the latter were massed in straight bacillary form lying side by side while others that were lying free were, more frequently, longer and more typical of the spirochæte in its undulant form. Extending deep into the wall and at some sites into the degenerating muscle layers, the spirochæte in short form with generally but one undulation, could be traced. There was destruction of histological arrangement of the wall with comparatively little cellular reaction, at some sites with polymorphonuclear, at others with small round and endothelial cells, while at others hæmorrhages were present. The rapidly progressive necrosis appeared due to production of a toxin or toxins.

The spirochæte found in such numbers shows the striking pleomorphism so common to the species of this group of micro-organisms. Though some of the smallest bacillary forms, seen on the inner surface of the ileum where the exudate was present, resembled *Bacillus fusiformis*, the association of the many forms of the spirochæte present in such a large number made it doubtful as to the presence of this micro-organism as a distinct entity. Not only did the spirochæte vary in size but in shape, and, when present, in the number of its undulations. When in the exudate they were closely packed and straight, resembling bacilli tending to elongated ends and varying from about 7 to 14 microns. Those less confined in the exudate were in general, but not all, longer, showed a faint or definite curve and had pointed or rounded ends. Amongst the free spirochætes much longer forms were to be seen, varying from approximately 10 microns to rare forms of 25 and 30 microns. The medium size with one to three undulations were the commoner; some of the longest showed up to five undulations and were often turned upon themselves, their thinness leading to ready distortion, and in the very long forms it was not always easy to determine pointed ends. Rarely was a granular body detected. In breadth they were practically similar throughout, approximately 0.25 to 0.35 micron, and in the more characteristic undulated forms there was no marked thickening at the convolutions and as a rule the tapering towards the ends was, when present, short. Deep in the necrotic tissue the spirochæte was practically alone, it occurred numerously and was readily traceable through to the circular muscle layer at certain of the necrosing sites. Their form herein was short with marked tendency to one undulation and more defined broader centre and thinner ends. All forms were Gram-negative, the granular body when present alone retaining the violet colour. The Giemsa stain showed up the spirochæte well.

DISCUSSION.

In the recent and most excellent medical report of the Hamilton-Rice Seventh Expedition to the Amazon by the Members of the Medical Expedition, and contributed to the *Journal of the Harvard Institute for Tropical Biology and Medicine*, No. 4, there was a classification of the spirochetes or "spirochætes" which cause disease in man into two groups; the first including those which produce *primarily local lesions* and the second those which give rise *primarily to infections of the blood*. To these I would presume to suggest tentatively that a third group be added, and that they be termed the mucosal group, on which the species found tend to live in relation to the mucous membranes. These may be exemplified: (1) By the species of spirochætes living saprophytically in the mouth and pharynx, one or more of which may assume pathogenic activity when favourable tissue soil is prepared by other more virulent micro-organisms or by lowered tissue resistance due to another cause. (2) By the *Spirochæta bronchialis* which develops on or in the mucous membrane of the air passages or by the *Spirochæta eurygyrata* on or in that of the appendix, cæcum or lower bowel. The habitat of these organisms in nature is not yet determined. (3) By genital spirochætes, normally saprophytic but with potential pathogenic activities.

In following the literature in recent discussions on the rôle of what I have presumed to designate as the mucosal group of spirochætes, it is evident that there

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are many experienced workers who do not accept the pathogenicity of the spirochaetes found predominant in certain pathological lesions as the causal organism; while others, equally capable from their experience, favour the importance of the spirochaete present and its aetiological significance in such a lesion. Frequent failure to produce comparable lesions in animals is the main contention of the former. But though attempts to infect lower animals with the mucosal group of spirochaetes have generally failed, how small has been the experimental work and how few the investigations upon this and the tissue-invading group. When they have received attention somewhat comparable to that given to the primarily blood-infecting group, more enlightenment on the above point will follow.

After these preliminary remarks I will now discuss the case under consideration this evening. Was it in this case that a saprophytic spirochaete had been given the opportunity such as initial symbiosis with the streptococcus present? or was a favourable nidus for development first formed in a lesion of tissue, in which the spirochaete acquired a degree of virulence sufficient to enable it to infect the membrane and later invade the necrosing bowel wall?

May I cite analogous examples, namely, in the readily demonstrable, partly mechanical, partly toxic activities of the less virulent *Spirochaeta eurygyrata* on the mucous membrane of the lower bowel in cases without previous history of colonic disorder; or, as is much more common, in infections following tropical dysentery or diarrhoea, as was first pointed out by Le Dantec.

Tunncliffe has found spirochaetes in a frontal sinus, and I have shown at the Royal Society of Tropical Medicine and Hygiene a comparable catarrhal condition of the antrum due to a mucosal spirochaete. Of the oral and pharyngeal spirochaetes we shall all agree that the *Spirochaeta vincenti* has been proved to be a tissue-invading organism, whether we consider it as only developing in already invaded or damaged tissues, or otherwise. Davis and Pilot have emphasized the importance of *Spirochaeta vincenti* and fusiform bacilli, not only in ulcero-membranous stomatitis and noma but in putrid otitis media, putrid bronchitis and gangrenous pneumonia. Ulcus tropicum need only be mentioned. On the other hand, we often meet with instances, such as cases of subacute gingivitis or chronic pyorrhoea, in which the normally saprophytic spirochaetes—especially *Spirochaeta buccalis*—are encountered in excessive numbers. Whether they be associated with scanty or with many streptococcal organisms, the degree of pathogenic importance to which they are entitled remains a more open question. Again the question has to be raised as to whether the *Spirochaeta bronchialis* of Castellani finds footing in the lung, previously infected or in other ways damaged (I have found it also in two cases of deep tracheitis), or is an extension down of the *Spirochaeta buccalis* and not a separate species. Its aetiological relationship to a definite diseased condition is, I think, proved by pathological and clinical findings including the results following specific treatment.

To what end does this discussion lead in diagnosing the aetiology of the lesions in the ileum in this present case? From pathological study there were found several acute lesions in which there were two organisms; one, a streptococcus, tending to remain on the surface of the necrotic ulcerations and—as was to be expected—lying practically alone on the peritoneal surface and thus pointing to the peritonitis being due to its extension through the perforation; the other, a spirochaete. What is the species of this spirochaete? Only being able to study it in stained specimens and in its relationship to the histological picture of the lesions I would not presume to classify it or to consider it an unidentified species. My first provisional diagnosis was *Spirochaeta vincenti*. That it possessed properties of toxicity and invasion of tissue is, I think, obvious. That it came from the oral cavity, in which there was a

prolonged condition of infection, and in which it may have acquired increased virulence; and that its attack and invasion of the ileum was aided or initiated by the streptococcus are, I think, plausible theories. I can arrive at no definite conclusion. The state and progression in hospital preceding death showed the acuteness and severity of the condition, and the temperature chart further points to little body reaction or response. Had it been possible to determine the lesions and activities of the spirochæte at the onset, specific antispirochætic remedies might have warded off the rapid necrosis and resulting perforation.

The publication of the Hamilton-Rice Expedition quoted above is so complete with references to other workers as well as subject matter, that only a desire to save repetition and space excludes citation of these workers' relevant publications on spirochætic infections.

I beg to tender my gratitude to the Directors of Medical Services, Ministry of Pensions, for permission to publish this communication.

Serological Tests for Hydatid Disease.

By ISA HILES, M.Sc.

(From the Department of Helminthology, London School of Hygiene and Tropical Medicine.)

THREE possible tests for hydatid infection have been investigated by various workers; all of these depend on the presence in the body fluids of a specific antibody induced by the absorption into the system of a greater or less quantity of protein of hydatid origin—this hydatid protein acting as an antigen or inducing the development, by the resistive mechanism of the tissues, of its appropriate antibody. These tests may not always succeed and their failure may be due to several causes:—

(1) The nature of the harboured cyst; it may be devoid, or nearly so, of scolices, or have undergone suppurative, or be degenerated and become either fibrosed or calcified.

(2) Very little antibody formation may be aroused in the host tissues owing to the small amount of antigen from the parasite.

(3) The failure of the irritating antigen to get through the laminated membrane formed externally by the parasite, and the more or less well-developed adventitious layer which the host has built up round the cyst as a protection for its tissues.

(4) The failure of the tissues of the host to react sufficiently strongly and produce sufficient antibody to be detectable, possibly through long illness, chronic disease of some form, exhaustion, etc.

Efforts to develop laboratory tests for hydatid infection were first made in 1906, by Ghedini, who applied the technique of the Bordet-Gengou reaction to the examination of the blood of patients suspected of harbouring hydatid cysts, and employed as antigen the hydatid fluid which he obtained from human cysts.

This brings us the first of the three tests, viz., the

(1) Complement-fixation Test.

Ghedini was followed by many workers during the years from 1908-13, the most noteworthy perhaps being Weinberg, who did a large amount of work in connexion with the test and in 1913 wrote a résumé of the subject and of the work previously done by others, for Kolle and Wassermann's "*Handbuch der pathogenen Mikroorganismen*."

Various forms of antigen were experimentally tried and elaborated by different workers; some used the pure hydatid fluid drawn off from sheep, cattle, pig or human cysts, others treated the fluid in various ways, evaporating it down, treating with alcohol, ether, etc., others advocated watery or alcoholic extracts of cyst membrane. All workers were agreed that the test did not always "succeed." Since

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the war the question of the application of this complement-fixation test to the detection of possible hydatid infection has been considerably investigated by workers in various countries, especially Australia, Germany, Italy, France and South America; of these may be mentioned Dubot, Pewny, Rubinstein, Blumenthal, Unger, Hamilton, Fairley, Rabinowitsch, van der Hoeden, Patterson, Williams, Bryce, Kellaway, Dew, Horowitz-Wlassowa, Pontano, Luridiana, Albo, Trenti, Ithurrat, Calcagno, and Jaffé.

Among these workers there was considerable difference of opinion:—(1) As to the best form of antigen (hydatid fluid proving of very variable strength antigenically), and (2) as to the absolute infallibility of the test as a means of diagnosis. The number of successful results averaged about 80 per cent. of all cases tested.

Two methods of setting up the complement-fixation test can be followed:—

(A) The method devised by Hamilton Fairley and given in detail in his paper in the *Quarterly Journal of Medicine* for April, 1922, xv, p. 244.

(B) The technique followed in the Wassermann test for syphilitic bloods; four variations of method are given in the "Special Report of the Medical Research Committee on the Wassermann Test," No. 14, published 1918, reprinted in 1921.

(A) *Hamilton Fairley's Method*.—He used pure hydatid fluid from the liver and lung cysts of sheep, large supplies of which he could always obtain from the slaughter houses as required. The outside of the cysts is swabbed with pure carbolic acid and the fluid drawn off by means of a sterile needle into a sterile receptacle and kept on ice till required. Fairley deprecated the addition of any antiseptic. The fluid must be quite free from turbidity and the cysts from which it is drawn should be healthy, active ones, not showing any signs of degeneration such as suppuration, calcification, etc. This fluid he used undiluted.

He advocated also the employment of saline and alcoholic extracts of well-washed scolices from the cysts, but found similar extracts of cyst membrane useless; he suggested that the antigenic faculty is derived from the scolices or from the products of their activities.

As regards the actual technique of this method, a full account is given in his paper previously referred to—which can be summarized as follows:—

The serum to be tested is drawn off from the clot, diluted with four volumes of normal saline and inactivated at 55.5° C. for twenty minutes, then kept on ice until required. It may remain useful for a week. The antigen is the pure, undiluted hydatid fluid. The complement is the serum from the blood of a male guinea-pig, pipetted off after standing on the clot for four hours.

The sensitized red blood-cells are prepared as follows: A 3 per cent. suspension in saline of sheep's red blood-cells (previously thoroughly washed four times with normal saline and centrifuged down between each washing) is prepared, and to this four minimum hæmolytic doses of anti-sheep hæmolytic serum are added, and the mixture incubated half an hour, then kept in the ice chest till required.

The first stage of the test is to standardize the complement by making a series of dilutions, 1:2, 4, 6, etc., up to 1:16 with saline, pipetting one unit of each into a series of tubes; to add one volume of sensitized red blood-cells and five volumes of saline and incubate at 37° C. for about ten minutes. The highest dilution at which hæmolysis is complete gives the minimum hæmolytic dose of complement. The guinea-pig serum is then diluted for use with saline so that the unit volume to be used in the test will contain 3 M.H.D.

For the test proper four tubes are required for each serum to be tested:—

	Row 1	Row 2	Row 3	Row 4
Hydatid fluid	1 ...	1 ...	1 ...	—
Serum (1:4)	1 ...	1 ...	1 ...	1
Complement (Unit = 3 M.H.D.)	1 ...	1.5 ...	2 ...	1
	(3 M.H.D.)	(4½ M.H.D.)	(6 M.H.D.)	
Saline	1 ...	0.5 ...	—	1
				(serum control)

Hiles: *Serological Tests for Hydatid Disease*

A complement control (1 + 3 vol. saline), an antigen control (2 + 1 vol. saline + 1 vol. complement), several known negative sera, and a known positive, are also set up.

The tubes are incubated for one hour, and then one volume of sensitized red blood-cells added and re-incubated for thirty minutes. If there is no hæmolysis of the red blood-cells in the first three tubes, that serum has fixed at least 6 M.H.D. of complement and is strongly positive; if complete hæmolysis has occurred in all tubes the serum is negative.

When Fairley used saline and alcoholic extracts these had first to be titrated in order to ascertain the minimum inhibiting dose (M.I.D.), i.e., the highest dilution that just fixed three M.H.D. of complement and prevented hæmolysis of the sensitized red blood-cells.

For the test proper in these cases one third of this amount is to be diluted with saline to make the unit volume used.

The drawbacks, in this country at any rate, to the employment of hydatid fluid are the two following:—(1) The difficulty of obtaining cysts, just when required. (2) The great variation in the antigenic strength of the fluids drawn from the different cysts.

(B) *Technique followed in the Wassermann Test for Syphilitic Bloods.*—For this second method of setting up the test (according to the four variations of technique given in the *Medical Research Committee's Report No. 14*) alcoholic extracts of scolices seem to make the most useful antigens.

The serum to be tested is inactivated at 55° C. for half an hour; the complement (i.e., the serum of a guinea-pig) must be titrated; the alcoholic extracts, which must have been previously carefully standardized, are diluted with normal saline at the time of use so that the unit volume to be used in each tube contains one third of a M.I.D.; and the sensitized corpuscles are prepared by mixing equal volumes of a 6 per cent. suspension of thoroughly washed red blood-cells in saline, with a saline dilution of the hæmolytic serum ten times as strong as that representing the M.H.D. (the resultant mixture being a 3 per cent. suspension of red blood-cells sensitized with 5 M.H.D.). The four methods differ in details of technique which are too long to be entered into here—full details are given in the above-mentioned pamphlet.

Some investigations have recently been made into the mode of preparation of the alcoholic extracts. The material used for their preparation consisted of the scolices and brood capsules obtained by centrifuging the fluid from a number of cysts; these are washed with normal saline, centrifuged, re-washed twice more, the deposit drained as dry as possible, ground up with a little sand and then treated with absolute alcohol. The deposit of scolices in other cases was dried over sulphuric acid or calcium chloride, then ground up and treated with alcohol. 20 per cent. suspensions in the alcohol were made and kept for from three to seven days at 37° C., also at room temperature, with frequent shakings. The alcohol was then decanted off, made up to the original volume, and kept in tightly stoppered sealed bottles. Alcohols of different strengths were employed:—viz.: 50 per cent., 70 per cent., 90 per cent. and absolute alcohol—for scolices from the same batch of cysts, and tested simultaneously. The period of extraction was also varied from three to seven days at both room temperature and at 37° C. Some batches of scolices were also treated with acetone before extraction with alcohol.

A series of tests was carried out with these various extracts with a large number of horses' bloods, some of these being from horses harbouring cysts. The results were noted and applied to the testing of two sera from patients suffering from hydatid. Of all the scolices extracts, those made with absolute alcohol from washed and dried scolices proved the most useful, and by making a 20 per cent. solution, these extracts could be used in such high dilutions that the danger of the amount of alcohol present affecting the reaction was avoided.

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The method of emulsifying the extract with saline was found to exercise a distinct effect on the strength of the reaction, the slow and gradual admixture of the two producing a more turbid emulsion and proving of advantage. The addition of a proportion of 1 per cent. alcoholic solution of cholesterol also seemed to help the reaction.

Accordingly, well-stoppered, sealed, absolute alcohol extracts of washed and dried scolices, carefully titrated beforehand, with the addition of cholesterol, and very slowly emulsified with the saline when diluting for use, form a stock antigen which can be kept in the dark at room temperature for several months without obvious deterioration and thus enable the test to be performed when required. The great variation in the quality of the hydatid fluids obtained in this country has emphasized the necessity for such a stock solution.

Bryce, Kellaway, and Williams, in Australia, have been experimenting with tryptic digests of scolices both before and after treatment with alcohol, and Dew and Williams have used a saline-solution extract of scolices digested with trypsin. That this tryptic digestion of the scolices produces a superior form of antigen is not clearly demonstrated.

Two other tests of a much less elaborate character are the (2) precipitin reaction, and (3) the Casoni (intradermal) reaction. As these are of a much simpler nature and require very little apparatus, etc., they can be undertaken by the general practitioner without special training in laboratory technique.

(2) *The Precipitin Test.*

This test relies on the production of a flocculent precipitate in a mixture of human serum and fluid material of hydatid origin, standing at room temperature for a period of time, if the serum comes from a patient harbouring hydatid.

The test was first applied by Fleig and Gisborne in 1907, and their work was followed by that of Welsh, Chapman, and Storey in 1908; all used fluid from human cysts, filtering it through a Chamberland filter. This form of test has been further investigated by several Australian workers. K. D. Fairley¹ gives full directions for its application. He found that as he carried it out it gave results practically identical with those of the complement-fixation test, and that it had the advantage of a simple technique with very little apparatus and an antigen that will keep satisfactorily for several months. He says that it is an absolutely specific test.

He used carbolized hydatid fluid, but the fluid must be of good antigenic properties to begin with, i.e., it must come from a healthy, active cyst. His directions are to draw off the fluid from such a cyst in the liver or lung of sheep, using all sterile precautions, and adding one volume of 5 per cent. carbolic acid to ten volumes of fluid, and storing on ice. The carbolic prevents any infection of the reagents from interfering with the results of the test, which can be read in from thirty to thirty-six hours after setting up.

The details are as follows: Approximately equal volumes of fluid and of *unheated* serum are placed in a sterile agglutination tube with fairly narrow bore—about 0.4 c.c. of each—the fluid first; no shaking is required, as the serum will gradually pass through the fluid to the bottom of the tube. Controls are set up thus: (1) serum with carbolized saline; (2) fluid with normal saline; (3) a known negative serum with fluid; (4) a known positive serum if available. The tubes are left on the table at room temperature for thirty to thirty-six hours; first a haze is noticed, which develops into a very fine precipitate, just below the top of the tube (this can be seen against a dark background); later it develops into a fairly heavy, flocculent white precipitate at the bottom of the tube. In strongly positive cases this may be about

¹ *Med. Journ. Austral.*, July 14, 1923.

Hiles: *Serological Tests for Hydatid Disease*

half way up the tube; a weakly positive reaction is indicated by a definitely visible, diffuse granularity, but no precipitate. The carbolic must not be increased in percentage volume, as from 0.75 per cent. upwards may cause a precipitate. The apparatus (tubes and pipettes) must be perfectly clean.

He found the fluid from sheep cysts superior to that of human origin. He carried out the tests also with fresh fluids (without carbolic acid) but these never gave superior results to those obtained with the carbolized fluids.

Bryce, Kellaway and Williams in 1924 stated that hydatid fluid is the only antigen useful for the precipitin test. This test is not so delicate nor so quantitative as the complement-fixation test, but it is very useful if doubtful readings are ignored.

(3) *The Casoni (Intradermal) Reaction.*

This is a cutaneous reaction and therefore not a laboratory but a clinical test, requiring the patient as subject. Casoni noticed that, after rupture of a cyst, the patient showed anaphylactic symptoms—erythema, rash, etc. He proceeded to apply this observation to a method of testing for possible infection, and published his results in the *Folia Clinica, Chimica et Microscopica* for 1911-12. He used filtered fluid from a sheep cyst with one drop of pure phenol added to 20 c.c. He injected 0.5 c.c. of this intradermally and noted the appearance or otherwise of erythema, rash, etc. He also tried extracts of cyst membrane but found them less satisfactory.

Testi and Zoli, and Luridiana in 1920 used fluid with the addition of chloroform and the latter obtained successful results in seven out of ten cases. Gasbarrini in 1921 obtained eleven positive results out of twelve by this test, and Sette in 1925 also found it the most successful of the three tests.

K. D. Fairley¹ also investigated this test, using pure fluids from sheep or human cysts, passing them through a Berkefeld filter and storing them in sterile ampoules in the ice chest, using no chemicals or preservatives. He found they still gave good reactions after seven months. He used 0.5 c.c. for the test and injected 0.5 c.c. of normal saline into the other arm as a control. He noted that in a few hours the hydatid fluid, in a positive case, produces an erythematous wheal frequently accompanied with pruritus and followed by *œdematous infiltration* round the puncture and that this area is further surrounded by erythema; and added that there may be a local rise of temperature; in eighteen to twenty-four hours there are signs of inflammation but nothing to speak of in the way of pain or tenderness; redness may be absent. There are no general symptoms—fever, pulse, etc., nor enlarged axillary glands; the whole reaction fades in forty-eight to seventy-two hours. In negative cases there is a rapid disappearance of the "orange skin" reaction at the site of puncture and it is soon difficult to find the spot. The failure of the test in suppurating cases he put down as due possibly to temporary desensitization from the absorption of a large amount of antigen.

Ithurrat and Calcagno (1923) used pure fluid, unheated and without the addition of preservative, keeping it in sealed receptacles after filtration. They used from 0.2 to 0.6 c.c. and obtained a reaction within fifteen minutes. They found the test successful in 133 cases out of 137 cases and prefer it to the other forms. Dew and Williams (1924) stated that the test is absolutely specific, but that care is necessary in its interpretation and that control experiments must be carried out. They describe the appearance of a wheal in twenty minutes, followed by erythema as the wheal disappears after about twelve hours, but they state that the reaction may vary; the wheal may persist for some hours, then disappear and the erythema not appear till from twelve to twenty-four hours later, or the wheal and slight erythema

¹ *Med. Journ. Austral.*, 1923, ii, p. 27.

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may appear for a few hours only. They think the reaction anaphylactic as well as toxic in nature, the wheal being a sign of the former and the erythema of the latter.

Mogena (1924) using 0.5 c.c. of ox, or 0.1 c.c. of human fluid, obtained positive reactions in all the fourteen cases he tested; he found the complement-fixation test gave only 73 per cent. of positives—eosinophilia was present in only 54 per cent.

Trenti (1924) used 3 c.c. of sheep or human fluid; he puts this test first, getting seventeen positives out of twenty-one, whereas the complement-fixation test yielded him only nine positives. He used pure fluid; and drew attention to the first and second stages of the reaction. He states that in cases of suppurating cyst the test is of no use.

Goldsmid (1924), in reviewing the question, states that according to Italian and South American workers the test is very reliable; he warns against rubbing the arm when cleansing the skin, advising just the application of a swab soaked in alcohol; he uses 5 c.c. of fluid. He notes the wheal and erythema followed by the cedematous infiltration, and says there is no risk if the fluid is filtered, kept in sterile tubes for five or six days at room temperature, examined for bacterial contamination (both aerobic and anaerobic), and any tubes showing turbidity discarded.

Kellaway¹ enters fully into the reaction; he used 0.2 c.c. of pooled fluids which had been filtered and incubated in order to test their sterility; he injected 0.2 c.c. of sterile saline into another area of the same arm. He draws a clear distinction between the two stages of the reaction; (1) the appearance in ten minutes of a wheal with spider-like outrunners surrounded by a wide zone of erythema—this fades after an hour; (2) six to eight hours later the appearance of a large area of erythema with infiltration and cedema of the subcutaneous tissues, no swollen glands, only slight itching and heat locally. This second stage is often missing after operation or when the cyst is suppurating. Kellaway lays stress on the importance of the first stage; he finds it correct in 90 per cent. results, some of these showing failure of the complement-fixation and precipitin reactions. He warns against the sensitiveness of certain patients to sheep protein, also stating that, as cutaneous sensitiveness to hydatid protein may persist for years, the positive result of the test then does not prove recurrence, and that it will be necessary to try the complement-fixation test; but he emphasizes the great usefulness of the intradermal test for diagnosis where there is no previous history. The first stage (wheal) is present in nearly all cases whether the other two tests indicate infection or not.

In conjunction with Dew and Williams, he found this test of greater value than the others, 92 per cent. giving positive results. They also showed that suppuration and rupture do not inhibit the primary reaction (wheal) although the second stage may not appear. Lemaire and Thiodet in 1926² dialysed hydatid fluid for the Casoni test, thus obviating any possible reactions provoked by other constituents of the fluid than the hydatid poison. They placed the fluid in a sac of gold-beater's skin surrounded by one of collodion, suspended it in a vessel of distilled water and placed it in the ice-chest. They found that after nine hours the dialysate (filtered through a Chamberland candle) was as strong a hydatid antigen as after twenty-four or thirty-six hours. They also found that heating at 55° C., or at 75° C. for thirty minutes did not alter its antigenic (toxic) nature. Lemaire, in a later paper, stated that only 20 per cent. of the complement-fixation and precipitin tests were successful, but said that he obtained 91 per cent. of successful results with the intradermal reaction using dialysed hydatid fluid.

A possible fourth test is the presence of eosinophilia in the blood-count, but this is regarded as a very variable factor by most workers who refer to it. A combination of two or more of the tests described above should prove extremely useful.

¹ *Med. Journ. Austral.*, April 4, 1925, p. 417.

² *Compt. Rend. Soc. de Biol.*, June 19, 1926, p. 166.



Section of Urology.

President—Mr. W. GIRLING BALL, F.R.C.S.

CLINICAL AND PATHOLOGICAL MEETING.

Adeno-Carcinoma of the Kidney.

Shown by W. GIRLING BALL, F.R.C.S. (President).

THIS specimen was obtained from a man, aged 34, whose first symptoms occurred in June, 1924, and were associated with a dragging pain in the left testicle attributed to a varicocele.

In December, 1924, he developed a sensation of fullness, not amounting to pain, in the left loin, accompanied with a fluctuating pyrexia, between 99 and 101° F. His urine at this time was stated to be normal. He had three subsequent similar attacks, lasting from eight to ten days, with intervals of three weeks. In April, 1925, he discovered that he was losing weight. This was attributed to a coliform infection of his urinary tract which he was then found to have. An investigation of his urinary passages was made, but as no cause for the infection could be discovered, he was given diuretic treatment and underwent vaccine therapy. During the same month he noticed a lump in his left hypochondrium which, he was of the opinion, varied considerably in size from time to time; when large, it was very tender. Pyuria was also considerable. The pain was increased by walking and relieved by rest. The same treatment was adopted and continued till May, 1926.

When I first saw him he was looking very ill and there was a fixed swelling in the region of his left kidney, which appeared to extend across the middle line. His back muscles were rigid.

An X-ray examination demonstrated a large cystic swelling with opaque areas along its margin, suggesting the appearance of a calcifying hydatid cyst. A pyelographic examination was made, which, in a stereoscopic picture, showed that the ureter ran over the front of this cystic swelling. In this situation its lumen was markedly diminished, and considerable difficulty was found in getting any of the fluid into the renal pelvis, which was lying in a horizontal direction across the top of the cyst.

Seeing that the patient was a veterinary surgeon and came from South Africa, a tentative diagnosis of a retroperitoneal hydatid cyst was made and an exploration advised. On June 25, 1926, I explored his lumbar region and discovered that this swelling was a growth of the kidney, of very considerable size, which had so altered the position of that organ that it lay in a transverse position with the renal pelvis pointing upwards and the ureter stretched out over its surface. The portion which could be felt passing across the middle line was a mass of lymphatic glands. I succeeded in removing the kidney, but was unable to get the lymphatic glands away.

The tumour is composed of intra-cystic branching polypi, made up of a single layer of columnar or cubical epithelium upon a delicate fibro-cellular scaffolding containing blood-vessels. The branching is very complicated, and so much folding has occurred that the fundamental arrangement is obscured. Many of the cells show vacuolation. In some places bleeding has occurred into the cystic space, and degeneration of parts of the growth has led to accumulation of masses of cell debris. The whole is enclosed within a thick fibrous wall, in which collections of pigment granules are seen, and some calcification has taken place in its less cellular parts. Outside this the renal tissue is compressed.

16 Ball: *Renal Carbuncle; Cope: Large Ureteric Calculus*

The interesting features of this case are: (1) That the symptoms of renal infection preceded the recognition of a renal tumour for about a year. (2) That a renal tumour can so alter the position of the kidney as to stretch the ureter over its surface. (3) That the capsule of a malignant tumour should have calcareous deposits in it.

Renal Carbuncle.

Shown by W. GIRLING BALL, F.R.C.S. (President).

PATIENT, a male, aged 23, was seized with a sharp attack of pain in his left loin while at work in February, 1926. This was followed by the appearance of a lump, for which he was kept under observation in the Temperance Hospital for seven weeks. No operative measures were adopted, but the patient was told that he had had an "abscess around the kidney." He remained well until August, 1926, when there was a similar attack of pain, on this occasion accompanied with hæmaturia. The symptoms persisted until his admission to St. Bartholomew's Hospital in October, 1926.

While under observation, his left kidney was found to vary in size from time to time; this was associated with persistent fever and purulent urine infected with the *Staphylococcus pyogenes aureus*. The X-ray examination gave negative evidence, beyond the fact that the kidney was large in size. A pyelogram which was made gave the characteristic appearances of a growth bulging into the renal pelvis.

On October 29, 1926, the left kidney was explored. It was surrounded by a dense mass of fibrous tissue—in many parts three-quarters of an inch thick—from within which it had to be enucleated. The kidney was greatly enlarged, and at about the centre of its length was a spherical swelling in the cortex, bulging into the renal pelvis, in which situation at one point it had ulcerated. This swelling was surrounded by a dense, fibrous capsule, within which were multiple small abscess cavities containing thick, yellow creamy pus, which on cultivation contained the *Staphylococcus pyogenes aureus*. The mass was so densely fibrous that it suggested the appearances associated with pyæmic actinomycotic lesions in the liver. In the upper pole of the kidney were multiple small necrotic areas also containing pus. The lower pole was natural. The renal pelvis, except at the site already mentioned, was normal and showed no other ulcerative areas. The calyces, however, were spread out in the fashion suggested by the pyelogram. The wound suppurred, otherwise the boy made an uninterrupted recovery.

It is interesting to note that he had suffered from boils all over his body for about a year before the onset of his original symptoms.

Two points of interest in this case are the pyelographic appearances which suggested the presence of a growth, and the nature of the lesion, which is very uncommon.

Large Ureteric Calculus.

Shown by V. Z. COPE, M.S.

THIS was removed from a lad on whom a left-sided nephrectomy had been performed a year previously for pyonephrosis. The patient first came under my care for continued pain on the same side as the previous pyonephrosis. A radiogram revealed the large calculus in the lower end of the ureter. It must have been overlooked at the previous operation. The stone is seen with the part of the ureter which was removed with it. Measurements about $1\frac{1}{2}$ in. by $\frac{3}{4}$ in. by $\frac{1}{2}$ in.

It is interesting to consider how pain, due probably to contraction of the muscular tube, may persist even when the kidney has been removed.

Section of Urology

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Pyelogram Showing a Large Calculus as an Area of Lesser Density in a Renal Pelvis filled with Sodium Iodide Solution.

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THE calculus did not show up in the radiogram taken before this injection. The composition of the calculus appeared to be chiefly hardened blood-clot, since only traces of uric acid, phosphates, and oxalates could be demonstrated; no cystin was present and hardly any ash remained after incineration.

An Unusual Arrangement of Double Ureter.

Shown by J. EVERIDGE, F.R.C.S.

THE patient from whom these pyelographs were obtained was admitted to hospital on account of severe pain in the right hypochondrium and flank, tenderness over the gall-bladder and some rise of temperature.

She was a stout and muscular woman, aged 50, and from her symptoms and physical signs it was difficult to decide whether she was suffering from gall-stone colic or a renal condition. There was marked resistance from the outer edge of the upper third of the rectus well down into the right flank. No definite tumour could be felt. The urine contained a few pus cells.

I performed chromo-cystoscopy and discovered on the left side a double ureteric opening, and on the right a single one normal in appearance. Dye was ejected forcibly from the three openings.

At first I considered the bilateral left ureteric orifice a coincidence of no significance. I then proceeded to pyelography of the right kidney when her symptoms had subsided, in search of information as to whether there might be an intermittent, possibly infected, hydronephrosis. The pyelogram obtained was interesting, and in my experience unique, though Sir John Thomson-Walker has an illustration in his book of a specimen somewhat resembling the condition which I assume to be present.

From the dilatation of the right ureter it would at once appear that there has been back pressure, and this may be the explanation of the pain and acute symptoms which brought her to hospital. As further evidence supporting this, I pyelographed the left side after catheterizing both the ureteric openings. No dilatation is present on this side, and the only observations to be made from inspection are the perfectly parallel course of the two ureters and the absence of crossing which we are accustomed to see.

The fact that the patient has only recently suffered from her first attack of real pain and disturbance is against the cause of pain being attributed to the malformation on the right side. Six weeks before there had been a slight discomfort which passed off in a few hours.

In spite of my pyelographic findings I decided to keep the patient under close observation. A future attack of pain may give a clearer indication as to whether the gall-bladder or kidney is responsible. I think it probable that at a future date I may have an opportunity of giving Members of the Section further information upon the case.

Jackstone Calculi.

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THE specimens I show were removed in the course of a suprapubic prostatectomy. The naked-eye appearance is responsible for the name, in their resemblance to jackstones or chuckstones—"little stones or knobbed metal pieces used in a child's

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Everidge—Hammond—MacDonald

game of throwing up and catching one or more at a time" (Funk and Wagnall). Pedersen, in his text-book, page 790, gives an illustration of stones very similar to those I am showing removed from the bladder of a man of 84. He does not state the chemical composition. Though, in mine, the appearance at first suggests a type of oxalate calculus, chemical examination revealed the only salt present to be ammonio-magnesium phosphate. The stones were peculiarly light, almost feathery in weight, and fractured easily.

No especial symptoms were caused by their presence, and in the case of my patient, a man of 78, nothing has occurred to suggest their re-formation since the operation I performed a year ago.

A Case of Lateral Uretero-Cystostomy.

By T. E. HAMMOND, F.R.C.S.

A. T., A MALE, aged 31. In September, 1918, slipped on a transport in Mesopotamia and injured the right side. This was followed by pain in the right lumbar region and retention of urine. As the symptoms persisted the right kidney was explored a fortnight later. The retention passed off but the pain persisted.

In May, 1924, he was admitted to the Royal Infirmary, Cardiff, under the Surgical Unit. Neither kidney was palpable. There was an efflux of indigo-carmin from the left kidney in six minutes, but that from the right was delayed. A pyelogram showed a stricture in the lower third of the ureter with a hydronephrosis above. This was explored through a right iliac incision, the ureter was freed and the stricture divided. There was a slight discharge of urine from the wound, which healed in four weeks. He remained quite free from pain until December, 1925, when the lumbar pain returned.

In June, 1926, he was again admitted under the Surgical Unit. Cystoscopy showed no efflux of indigo-carmin from the right ureter and that from the left occurred only in eight minutes. A catheter passed up the right ureter for a distance of only 5 cm. The pyelogram showed a stricture of the ureter with marked dilatation above, and also a hydronephrosis. The blood-urea was 65 mgm. As nephrectomy was contra-indicated, the right ureter was explored through the paramedian incision. The ureter was bound down by dense fibrous tissue below the pelvic brim; above it was dilated to a diameter of 1 in. Attempts to free it from the surrounding structures in order to do an end-on anastomosis were unsuccessful, so the bladder was brought up to the pelvic brim and united to the ureter by two rows of sutures. The bladder was drained through the paramedian incision.

No urine came from the wound five weeks after the operation, but pain was produced in the right lumbar region during each act of micturition. A cystogram taken on discharge showed the solution of sodium iodide passing up into the right kidney through the anastomotic opening.

Prostatic Enlargement following Prostatectomy.

Shown by S. G. MACDONALD, F.R.C.S.

THE specimen shown is a complete adenomatous prostate removed on account of hæmorrhage from a patient (G. D., aged 68) in August, 1926. Prostatectomy had been performed previously in 1916, in another London hospital, and a myo-adenomatous gland removed.

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Hydatid Cyst of the Left Kidney.

Shown by A. CLIFFORD MORSON, O.B.E., F.R.C.S.

FEMALE aged 56. Admitted to hospital with a swelling in the left loin which the patient said she had noticed for twenty years. The swelling was definitely palpable through the loin muscles and felt very hard; it was connected with the kidney. There were no urinary symptoms and no pain. A skiagram showed mottling in the renal area.

Pyelography.—Calyces anatomically normal. Tumour connected with the lower part of the kidney. Operation: left nephrectomy. Convalescence uneventful.

The specimen on examination proved to be a hydatid cyst of the lower pole of the left kidney, the wall of which was calcified. The contents consisted of gelatinous material and numerous daughter-cysts. Echinococcus disease of the kidney has often been recorded in South Africa and Australia, but in this country the disease is rare. The colony may lodge in the renal sinus or beneath the capsule (as in the case now recorded) and has been known to rupture into the pelvis.

Closed Renal Tuberculosis.

By C. A. R. NITCH, F.R.C.S.

M. B., FEMALE, aged 30.

June, 1926.—Pyuria with tubercle bacilli in urine.

August, 1926.—*Cystoscopy* and catheterization of ureters. Bladder and ureteric orifices normal. Left urine normal. Right urine—a few pus cells but no tubercle bacilli.

September, 1926.—*Cystoscopy*. Bladder healthy; right ureteric orifice slightly congested.

Right urine clear, sterile, no deposit, no tubercle bacilli. Urea concentration 1 per cent. Left urine normal. Urea concentration 2·3 per cent.

Operation.—Right nephrectomy.

The upper pole of the kidney contains a large lobulated tuberculous abscess which is completely excluded from the pelvis by scar tissue at the apex of the funnel-shaped upward prolongation. The remaining pelvis and calyces are apparently healthy.

The renal parenchyma shows signs of chronic interstitial nephritis.

Embryonic Sarcoma of Kidney.

By E. G. SLESINGER, O.B.E., M.S.

J. W., MALE, aged 9, seen in consultation with Dr. Fisher, on July 7, 1926. Four days previously he had noticed hæmaturia, and Dr. Fisher had then found the abdominal tumour. There was a large painless swelling in the right side of the abdomen, inseparable from the liver and bulging well back into the loin.

Cystoscopic examination showed nothing abnormal, and a pyelogram of the right kidney showed an enormously distended and enlarged pelvis, which suggested an embryonic sarcoma.

The urine contained some blood and pus, and the blood-urea estimation was normal. After the pyelography he was very ill for three days, with symptoms suggesting intestinal obstruction, but recovered rapidly.

Operation (July 26).—A long right-angled incision, similar to Perthes' gall-bladder incision, was made; the rectus was stitched and its sheath divided, and the posterior peritoneum over the tumour was incised. The omentum was attached to the tumour

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at one place and was divided. The tumour was shelled out of its bed, and the pedicle ligatured in sections. The ureter was divided and the tumour removed. Oozing was easily stopped and the abdomen closed without drainage. The left kidney was normal on examination. He was given a blood transfusion of 15 oz. an hour after the operation, and made a rapid recovery. The wound healed by primary union and he left the home in three weeks. He remained perfectly well for six months, and then died of a rapidly growing recurrence.

The specimen is shown as being suggestive of the view that these tumours originate in some retro-renal structure rather than in the kidney itself.

Sections of the growth were reported by Dr. Nicholson to exhibit an embryonic sarcoma.

Squamous Carcinoma of the Renal Pelvis associated with Renal Calculus.

By Sir JOHN THOMSON-WALKER, F.R.C.S.

PATIENT, B., male, aged 63, had passed calculi at intervals for twenty-seven years. For two years there had been stabbing lumbar pain and recently severe attacks of pain about once a fortnight. There had never been hæmaturia. The right kidney was much enlarged. There was increased frequency of micturition and the urine contained a heavy deposit of pus and gave a pure culture of *Staphylococcus albus*.

X-ray examination showed a large heavy irregularly rounded shadow with a somewhat ill-defined edge in the right lumbar area.

Operation (November 20, 1926).—Right nephrectomy, followed by uninterrupted recovery.

The kidney had the external appearance of a large calculous pyonephrosis. Upon incision a quantity of pus and debris escaped from the dilated pelvis. A large rounded calculus with a rough surface lay in the pelvis in a bed of greyish white shaggy material resembling asbestos. This material lined the middle one-third of the pelvis and extended into the slightly dilated calices at this level. It was $\frac{1}{2}$ in. to $\frac{1}{4}$ in. in thickness. The surface was shaggy and the upper and lower edges were sharply defined. The renal pelvis and calices above the affected area were dilated.

Microscopical examination of the asbestos-like lining showed leukoplakia which passed into squamous carcinoma with cell nests.

The infiltration had not penetrated beyond the muscular wall of the pelvis and there was no infiltration of the kidney substance. No enlarged lymphatic glands were found at the operation.

Recurrence of Enlarged Prostate after Prostatectomy.

By Sir JOHN THOMSON-WALKER, F.R.C.S.

PATIENT, J. C., aged 67, consulted me in 1896 on account of frequent micturition and recurrent attacks of retention of urine. The residual urine amounted to 28 oz., and there were signs of uræmia.

Rectal examination revealed a large elastic, movable prostate.

On May 24, 1916, I performed prostatectomy by the blind method and removed a large soft prostate. Convalescence was uneventful.

The patient remained free from symptoms for eight years, but two years ago he had an attack of epididymitis with frequent micturition and difficulty. This abated, but recurred a week before I saw him.

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On rectal examination the swelling felt like an ordinary enlargement of the prostate of moderate size, and had I not known the previous history I could not have said that any operation had been performed upon it. There was obstruction at the internal meatus to the passage of a catheter.

On August 23, 1926, I opened the bladder and found a prostatic nodule the size of a cherry projecting into the bladder at the posterior lip of the internal meatus. Partly by dissection and partly by enucleation, a structure similar to an enlarged prostate was removed and the case was treated as an ordinary open prostatectomy. The specimen representing this second prostatectomy, viewed from the posterior aspect, resembles the enucleated specimen of an ordinary enlarged prostate. Seen from the anterior aspect the ring at the internal meatus is complete, but below this the ring is incomplete, and there is a wide tunnel representing the prostatic urethra: this would admit the forefinger and it is wider below than above. The lining of this tunnel is smooth and there are numerous small openings, apparently the ducts of glands, in the wall.

Microscopical section showed an appearance like that of an ordinary enlarged prostate gland, namely, gland tubules in groups, dilated and embedded in non-striped muscle, fibrous and elastic tissues.

Closed Renal Tuberculosis.

By H. P. WINSBURY WHITE, F.R.C.S. (for CECIL JOLL, F.R.C.S.).

THE specimen is a right kidney removed by Mr. Cecil Joll from a male, aged 20. It shows a complete absence of renal parenchyma, which is replaced by caseous masses partly calcified and fibrous tissue, the latter having completely obliterated the lumina of the pelvis and the ureter. There is a perforation half an inch in diameter at the upper pole of the organ, through which the fluid products of the tuberculous disease had escaped into the perinephric tissues.

The patient was sent to Mr. Joll because he had himself noticed a visible painless swelling in the right side of the abdomen. He had never suffered from any urinary symptoms nor had he any recollection of discomfort in the right kidney region at any previous date.

On examination the patient was seen to be of healthy appearance. There was, however, a visible bulging in the right loin projecting laterally and posteriorly. The swelling was cystic and lacked tenderness.

A radiogram of the urinary tract revealed the right kidney as a calcified mass. The urine was free from pathological elements.

On cystoscopy the patient I was able to make out a healthy bladder with a small and inactive right ureteric orifice, which would not admit a ureteric catheter, while there were two healthy and active ureteric orifices to the left of the mid-line. Intravenous indigo-carmin injected during the cystoscopy showed good functional activity from both orifices on the left side, with no appearance of the dye from the right within fifteen minutes of the injection.

From these findings the diagnosis of closed renal tuberculosis with calcareous change on the right side was made.

When Mr. Joll cut down on the right kidney the cystic swelling was found to be a collection of straw-coloured fluid lying in the perinephric capsule and in the sheath of the quadratus lumborum, which was the seat of a small focus of tuberculous granulation tissue. The kidney was removed and the patient made an uninterrupted recovery.

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The points of special interest are (1) that 20 years is an unusually early age at which to find closed renal tuberculosis with calcification; (2) that the case belongs to that group of closed renal tuberculous cases which proceed even to the stage of complete destruction of the parenchyma without giving rise to urinary symptoms of any kind; and (3) that although the organ showed an advanced stage of repair inasmuch as the whole kidney was replaced by calcifying caseous and fibrous tissue, yet it was still capable of disseminating tuberculous infection, as seen by the ulceration in the quadratus lumborum.

The ease with which an accurate diagnosis can be made in such a case, with the proper interpretation of the radiographic and cystoscopic findings, is a point of more practical interest.

Hydronephrosis of Left Kidney due to Stricture of Pelvi-Ureteral Junction.

By D. S. DAVIES, M.B.

The specimen is a left kidney removed by operation from a male patient, aged 46. The organ shows moderate enlargement and on section the pelvis is seen to be markedly dilated. This dilatation has extended so that the cortex is somewhat thinned and the calices enlarged. At operation two small stones were found occupying two of the lower calices. The pelvic mucosa is congested and thickened as a result of pyelitis. The most striking lesion, however, is the marked stenosis at the pelvi-ureteral junction. Here is a definite stricture, well seen, because the specimen shows the whole extent of the pelvic and ureteric walls in this region.

Clinical features.—A remarkable feature in the case was the shortness of the history. The patient noticed slight hæmaturia three weeks before admission, and after one week's freedom from trouble, he had dull aching pain in the left loin for fourteen days. There was no frequency of urine, dysuria or other symptom pointing to the urinary tract.

On examination the left kidney was found palpable but not tender. Cystoscopy revealed no anatomical lesion, but it took 8½ minutes for the indigo-carmin to be excreted from the left kidney while it appeared in 4½ minutes from the right side. A pyelogram of the left kidney showed a well marked hydronephrosis of the pelvic type with two small stones in the lower pole of the kidney. The capacity of the pelvis for the opaque fluid was 30 c.c. Patient made a good recovery after the nephrectomy.

The special point of interest in this case is the definite pyelitis associated with a moderate hydronephrosis secondary to a ureteral stricture of unknown aetiology. In view of the smallness of the stones it is probable that they are secondary to this hydronephrosis.

[January 27, 1927.]

Affections of Micturition Resulting from Lesions of the Nervous System.

By F. J. F. BARRINGTON, M.S.

Anatomy of the Nerves to the Bladder and Urethra.

THREE pairs of nerves are concerned with micturition, but none of them exclusively so. The bladder and unstriated muscle of the proximal part of the urethra receive fibres from the hypogastric plexus. The hypogastric plexus on either side is formed by the anastomosis of branches of two nerves, the hypogastric nerve and the

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pelvic nerve [5, 7, 11]. The pudic nerve is concerned with micturition in that it gives rise to a branch which supplies the compressor urethræ.

The hypogastric nerve is part of the sympathetic system. The white rami of the most caudal of the anterior—and therefore of the mid-lumbar—spinal roots from which the sympathetic system arises, give off branches which run through the sympathetic chain to the inferior mesenteric ganglia. These branches are called the lumbar splanchnic nerves and most of their fibres which go to the bladder terminate round cells in the inferior mesenteric ganglia. The inferior mesenteric ganglia are situated on the sides of the origin of the inferior mesenteric artery. The hypogastric nerves arise in them by the axons of the cells round which the lumbar splanchnic fibres have arborized.

The pelvic nerve arises from two of the more caudally situated sacral roots, and therefore roots intervene, which contain no bladder fibres, between its origin from the cord and that of the sympathetic. Each of its fibres breaks up round a cell before its distribution to the bladder, but this cell is on the bladder wall and therefore distal to where the nerve itself breaks up into the branches to the hypogastric plexus.

The pudic nerve arises from the sacral roots and, being a nerve supplying skeletal muscle, has no cells interposed in its course between its origin and termination.

All three pairs of nerves contain afferent as well as efferent fibres, but as none of them exclusively supply the bladder and urethra it does not follow, in any particular case, that these are concerned with micturition.

The contraction of the bladder resulting from stimulation of the spinal cord is abolished if both hypogastric and both pelvic nerves are divided, from which it follows that these are the only direct ways in which the central nervous system can influence the bladder.

(1) Lesions of Peripheral Nerves.

Micturition is performed normally in dogs [14] and in cats [1] after division of both hypogastric nerves. In cats a slight degree of frequency follows the operation [2].

Division of both pelvic nerves in dogs [12] and in cats [1] is followed by retention of urine with overflow. If unrelieved the over-distension leads to submucous hæmorrhages which subsequently may produce ulceration of the mucous membrane, often accompanied by considerable hæmaturia. The animals show no distress and do not resent having the bladder squeezed, from which it seems certain that the pelvic nerves carry all the impulses leading to the distress which accompanies acute retention. After a variable period of days overflow with incontinence disappears, the animal then remains dry and voluntarily passes small quantities of urine in the ordinary way, but always has a large volume of residual urine. This condition is permanent, and persists after subsequent division of the hypogastric nerves. Division of the pudic nerves at this stage leads to some diminution in the residual urine, abolition of the voluntary acts of passing urine and a more or less continual dripping of urine from the urethra, which leads to the perineal region again being soaked with urine. It follows, therefore, that the voluntary acts of passing urine after division of both pelvic nerves are due to relaxation of the compressor urethræ through the pudic nerves, and that these nerves must carry impulses to the central nervous system which produce part of the conscious desire to micturate, though, for reasons already given, this cannot be the distressing sensation of retention.

The syndrome described, arising from division of the pelvic nerves in dogs and cats, occurs clinically in three circumstances. It is not uncommon after labour, it is usual in incarceration of a retroverted gravid uterus, and occasionally it follows pelvic operations, particularly excision of the rectum. In all three cases an over-distended bladder is discovered either because the patient complains of incontinence or in the

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course of a routine examination and not because the patient complains of inability to micturate.

In the cases which follow labour this is not necessarily instrumental. Such patients, after relief by catheterization, pass urine themselves in a few days, but have a very large residual. The residual urine gradually diminishes and recovery is complete in a few weeks.

The usual complaint in cases of incarceration of a retroverted gravid uterus is that of incontinence of urine; examination shows that the bladder is distended, and no distress from retention is present. Such cases recover when retention and retroversion are relieved. In both these cases the loss of function of the pelvic nerves must be due to mechanical stretching or pressure, and not to any solution of continuity of the nerves.

The branches of the two lower sacral nerves which go to form the pelvic nerve in man are relatively long, and the pelvic nerve formed by their union breaks up into its branches almost at once. It follows that, except at a single point, at least two nerves must be divided on either side to destroy completely the sacral nerve supply to the bladder, a fact which probably accounts for the relative rarity of the abolition of micturition resulting from pelvic operations. When the injury has been done, retention with overflow results, which commonly leads to death from pyelonephritis before the patient has recovered from the operation. Should he escape this, small quantities of urine are passed voluntarily, but a large volume of residual urine persists; this usually becomes diminished upon the supervention of severe cystitis, but not in consequence of any other process.

After division of both pudic nerves cats micturate as before. They do, however, show more or less evidence of incontinence. Sometimes this can only be shown by the escape of a few drops of urine if the bladder is gently squeezed, sometimes the cat spontaneously loses a few drops when it is making some strong straining movement, such as jumping, and occasionally the lesion is followed by the loss of urine in drops during quiet movements [1]. The urethra between the internal meatus and the compressor urethræ, both in the cat [9] and in man [17], is closed by muscular contraction, and does not constantly contain urine except during micturition. The closure of this part of the urethra is strongest at the compressor urethræ [6], which is supplied by the pudic nerves.

From these facts it follows that the compressor urethræ, or its nerve supply, can be damaged in surgical operations without producing any serious degree of incontinence, only as long as the urethra between it and the internal meatus is intact. This injury is probably quite frequent in the course of the performance of external urethrotomy and of no harm results. The urethra between the internal meatus and compressor urethræ is destroyed by suprapubic prostatectomy [17] and occasionally by prostatic suppuration; a perineal operation which involves the compressor urethræ after either of these is very likely to be followed by permanent incontinence.

The action of the compressor urethræ probably partly determines the relative incidence of prostatic abscess arising spontaneously from a urinary infection in the various forms of lower urinary obstruction. It is known, clinically, that spontaneously occurring prostatic abscess is a fairly frequent complication of urethral stricture and of central nervous diseases producing residual urine, but is very rare in senile enlargement of the prostate. In the last case the openings of the prostatic ducts are distal to the obstruction and therefore are not exposed to any increased pressure from the urine during micturition. In all nervous lesions producing residual urine and not involving the pudic nerves or their origin, urine is held at the compressor urethræ and therefore the openings of the prostatic ducts are continually subjected to intravesical pressure. In urethral stricture during

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micturition the pressure on the duct openings must be very greatly increased and it seems probable that in advanced cases the prostatic urethra is dilated and permanently full of urine. Rabbits occasionally acquire paraplegia after injuries of the cord due to fracture of the spine from muscular action. In such cases when retention of urine and overflow has resulted, the vesicula seminalis can be seen to be tensely distended with urine.

(2) Lesions of the Sacral Dorsal Roots.

In dogs [13] and in cats [1] division of all the dorsal spinal roots in the sacral region is followed by retention of urine with overflow incontinence, and hæmaturia may result. The urethra remains constantly firmly contracted. The urine drips away, is not passed in jets and is not passed voluntarily. The condition is permanent and it is not modified by subsequent division of the hypogastric nerves. As after division of both pelvic nerves, the urethra from the internal meatus to the compressor urethræ is full of urine. The bladder condition after this lesion is associated with dilatation of the rectum, but not with impotence.

Micturition is commonly affected in tabes, and where an affection is present it resembles that produced experimentally by division of the dorsal spinal roots in the sacral region. Impotence is also common in tabes, but is not necessarily associated with an affection of micturition. When micturition has become markedly deranged the patient complains of incontinence which is worse at nights. Difficulty in micturition is not as a rule complained of, though the patient generally admits he has to strain to get the urine away. Frequency is present, but is entirely voluntary; either no desire to pass urine is ever experienced, or the desire and the passage of urine occur nearly simultaneously. In both cases the patient has learnt by experience that he keeps drier if he makes repeated efforts to pass urine at times when he has no desire to do so. The symptoms are associated with a large volume of residual urine and a greatly increased tolerance to artificial distension of the bladder, except when the walls of the latter have been markedly altered by inflammation.

The constant presence of residual urine, and of urine in the prostatic urethra in cases of tabes with an affection of micturition, is of significance if a prostatic abscess develops and is opened in the ordinary way through a perineal incision. As in other cases of prostatic abscess the abscess has generally made a communication with the prostatic urethra or bladder, or both, by the time it is opened. The effect of opening it is therefore to make an external fistula. This is of no significance in prostatic abscesses in other conditions, but in tabes the internal opening will be constantly exposed to urine under a positive pressure. This will always lead to delay in healing and may make the fistula permanent, a condition which can only be dealt with by a permanent suprapubic cystotomy.

(3) Lesions of the Central Nervous Axis.

Many experimental observations on micturition have been made by passing a catheter in female animals under an anæsthetic and gradually distending the bladder with warm water; with a certain distension a reflex contraction of the bladder results, leading to the expulsion of a greater or less part of the water at the side of the catheter; this has been called reflex micturition. The method, at least in cats, is not of much use, as the anæsthetic greatly interferes with the reaction and a considerable volume of residual is usual. If, however, the same thing is done on a decerebrate cat which has been allowed to come round from the anæsthetic, the residual is insignificant and not more than the interference of the catheter might easily account for. Further, if a decerebrate cat is kept alive by careful regulation

of its surrounding temperature for a sufficient time, micturition can occur spontaneously without any appreciable residual urine. Owing to ossification of the tentorium the plane of decerebration is fairly constant and goes through the superior colliculi on the dorsal side and through the crura at the superficial origin of the third nerves ventrally. Micturition can therefore take place in the absence of the parts of the brain in front of this plane and animals on which the operation has been performed can be used for its further investigation.

In the cat there are about 3 cm. of urethra between the internal meatus and the prostate. If this is divided proximally and a cannula tied into each cut end, the bladder contraction and urethra relaxation can be observed under varying conditions by means of a water manometer connected with each cannula. The paths of the reflexes so observed, and their level in the central nervous system, can be determined by section of various pairs of nerves and by transecting the cord or brain stem at various levels respectively. In this way micturition can be found to be composed of five reflexes [3] as follows:—

(1) Distension of the bladder gives rise to strong contraction of the bladder. Both efferent and afferent paths are in the pelvic nerves and the reflex is situated in the hind brain.

(2) Running water through the urethra gives rise to strong contraction of the bladder. The efferent path is in the pelvic nerve, the afferent in the pudic, and the reflex is situated in the hind brain.

(3) Distension of the urethra between the internal meatus and compressor urethræ gives rise to weak contraction of the bladder. Both efferent and afferent paths are in the hypogastric nerves and the reflex is situated in the cord.

(4) Running water through the urethra gives rise to relaxation of the urethra. Both paths are in the pudic nerves and the reflex is situated in the cord.

(5) Distension of the bladder gives rise to relaxation of the urethra. The efferent path is in the pudic nerve, the afferent in the pelvic and the reflex is situated in the cord.

It is evident that these reflexes are such that when one arises the others are brought into action by it. From this it follows that the undoubted existence of a direct voluntary control over micturition does not necessarily imply a direct voluntary control over the smooth muscle of the bladder. For instance, if the stimulus to the bladder contraction in the second reflex is not the actual running of water through the urethra, but the relaxation of the compressor urethræ produced by this through the fourth reflex, voluntary micturition could be produced by voluntary relaxation of the compressor urethræ, which is a striped muscle.

These reflexes make it plain why urine is normally held at the internal meatus. After paralysis of the compressor by division of both pudic nerves, the urethra between the compressor and the bladder still remains closed and a certain, though much smaller, pressure is required to force it open. This pressure is greater than that necessary to evoke the first reflex and therefore micturition occurs before the posterior urethra can become chronically distended. If, however, the pelvic nerves, dorsal sacral roots or spinal cord are divided the first reflex is destroyed, and then the urethra between the bladder and compressor becomes chronically distended.

The second reflex can easily be produced experimentally, when a catheter has been passed, by slightly withdrawing and then pushing back the catheter; it therefore explains the importance of holding a cystoscope still when an irritable bladder is being washed out.

In cats and dogs transection of the spinal cord in front of the sacral region at any level compatible with life is followed by retention of urine and overflow. After some days a condition known as spontaneous (or automatic) micturition appears [8]

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together with a considerable diminution in the volume of residual urine. When spontaneous micturition has appeared the animal passes urine periodically in series of rhythmic jets, the first jet of each series generally being the largest. The jets often seem to occur spontaneously and are then probably provoked by distension of the bladder or proximal urethra. They may easily be elicited by touching the perineal region or by anything calculated to increase the pressure in the bladder or proximal urethra, such as any strong movement, holding the animal vertically, or slight pressure on the abdomen. There is always an appreciable and generally a large residual urine. The rhythmic jets of urine can be seen to occur at the same intervals as rhythmic contraction of the perineal muscles. The development of spontaneous micturition appears to depend entirely on the lowering of the urethral resistance which gradually follows after a spinal transection and which is possibly higher than normal immediately after the lesion. This decrease in the resistance to the escape of urine can be felt to occur if the bladder is partially emptied by compression through the abdominal wall. Rhythmic relaxations in the resistance of the urethra can be felt to occur from the first, before the establishment of spontaneous micturition, but it seems that when the resistance is high its difference in these rhythmic relaxations is insignificant for the intravesical pressure, and therefore no jets of urine result. Spontaneous micturition does not appear to arise from a re-establishment of reflex contraction of the bladder, since, if a cat with a spinal transection, in which it has become established, is decerebrated and the reflexes of the bladder and urethra already described are examined, the first and second reflexes cannot be elicited.

Transverse lesions of the cord in man give rise to the same effects on micturition as in dogs and cats, but in the latter stages these are always modified by a greater or less alteration in the bladder from infection.

The efferent paths of micturition in the spinal cord in dogs [14] and cats [15, 16] are in the dorsal parts of the lateral columns. These are affected in man in Erb's paraplegia, typically an extensor plantar response is also present, but it seems probable that micturition is not infrequently affected alone. In this case diagnostic errors are likely to occur, particularly if the patient happens also to have an enlarged prostate.

The position of the micturition reflexes in the hind brain of the cat was found by means of the stereotaxic instrument of Clarke [10]. Bilateral lesions at the anterior end of the hind brain just ventral to the internal edges of the superior cerebellar peduncles resulted in a large volume of residual urine, whereas similar lesions near but not exactly in this position did not affect micturition [4]. This is not a part of the brain where chronic disease is frequent in man; retention of urine, however, does occur in pontine gliomas.

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Simpson: *Angeioma of the Kidney***Angeioma of the Kidney.**

By GRAHAM SIMPSON, F.R.C.S.

I HAVE ventured to draw your attention to a case of angeioma of the kidney because of the rarity of this condition, of its pathological interest, of the impossibility of diagnosing it beforehand, and because I consider the treatment of such cases to be either uncertain and inefficient or unnecessarily—one might say absurdly—drastic.

That the condition is rare is shown by the fact that I have collected only fourteen cases from the literature and, though I have inquired diligently of my colleagues I have not so far found an unrecorded case. If, however, I have inadvertently missed out any cases, I should be very glad to rectify the omissions. It is not very easy to collect these cases from the literature as they are classified under so many different headings: Nævus, hæmangeioma, angeioma, hæmaturia, essential hæmaturia, varix and varicose veins.

I have purposely left out the cases of which there are a considerable number recorded, especially those recorded by Newman and by various American surgeons, in which the pathological findings are described as "dilated veins at the apex of a renal papilla." I have never seen such a case, but the condition seems to be quite characteristic and, as it is sometimes associated with a condition of interstitial nephritis, it is quite likely to be due to constriction of the veins by fibrous tissue.

Anyone who has looked at a cavernous angeioma will have no difficulty in agreeing that this is certainly not due to dilatation of pre-existing veins. If further proof were needed of its rarity, it could be inferred from the fact that a urologist with such extensive experience as Professor James Israel has never seen such a case; in his latest book on renal surgery he gives a very brief account of this condition; I am sure he would have given details of any case he had operated upon.

Curiously enough, though I have collected a few cases from German and Scandinavian sources, I have not met a single instance in the French journals.

The pathology of angeioma of the kidney is interesting; there is no reason why such cavernous angiomas should not occur in the kidney; they occur in the liver; but it is curious that nævi, in such a sheltered situation, should begin bleeding.

Although nævi are common enough, it is very uncommon, in my experience, for hæmorrhage to occur from them; in the Pathological Museum of University College Hospital there are two specimens of cavernous angeioma of the tongue—in both cases it had been necessary to remove part of the tongue to stop the bleeding; there is also a specimen of cavernous angeioma of the anal canal in which the patient actually lost his life from this cause.

Such angiomas are obviously exposed to mechanical injuries, but the one I am about to describe occurred at the apex of a renal papilla and was not much larger than the head of a pin; such bleeding might conceivably be set up by an injury to the kidney or by the presence of a stone in the renal pelvis or, perhaps, by the congestion due to an abnormal mobility of the organ; none of these factors was present in my case nor are they mentioned in any of the cases I have collected.

In fact, one of the striking features of these cavernous angiomas is their innocuous character; though, no doubt, if situated on the face they may cause a good deal of maternal anguish.

What I own I did not realize before delving into the literature was that cavernous angiomas may occur as well as encapsuled tumours and be mistaken for sarcomata; Christopher Heath removed such a tumour from the temporal fossa.

Dr. Usher, of Aberdeen, at the Edinburgh meeting of the British Medical Association in 1898, communicated a case of cavernous angeioma of the orbit, which caused such extreme proptosis that it was found necessary to remove the eyeball as well as the tumour; Dr. Usher kindly showed me the tumour and the microscopical section; the tumour is completely encapsuled and is of the size and shape of an eyeball; it is a typical cavernous angioma.

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The most extraordinary of these tumours is recorded by Sir John Bland-Sutton; it was found at the autopsy of a woman, aged 54, who died suddenly in an asylum to which she had been admitted for acute mania; the tumour was as large as a walnut, grew from the wall of the left auricle and was sufficiently pedunculated to fall into and block the mitral orifice.

Before discussing the diagnosis I will read the notes of my case:—

In February, 1923, I was asked to see a single lady, aged 30; she had been passing bright red blood in the urine for the last four days; she had complained of no pain whatever and, except for some frequency of micturition, there were no other symptoms.

About eighteen months previously she had a suspicion that there was something wrong with her urine, but she said nothing about it to her relatives, and did not consult her doctor. A routine clinical examination revealed nothing else abnormal; an X-ray examination showed no shadow of a stone and the urine was sterile.

She was at once admitted to a nursing home and cystoscoped; the bladder and the ureteral orifices were normal; from the right ureter were seen to issue frequent jets of bright red blood; the left kidney was found to excrete indigo-carmin in five minutes from the time of intravenous injection. After waiting two days, as the bleeding was not diminishing and the patient was showing signs of serious anæmia, consent for operation was obtained.

Operation.—The right kidney was exposed through an oblique lumbar incision; it looked and felt perfectly normal; it was removed and the patient rapidly recovered.

On section, the kidney appeared quite healthy; the bleeding had evidently come from the uppermost calyx as there was some clot and discoloration there; there was no obvious ulceration and I was about to class the case as one of "essential hæmaturia" when my anæsthetist, Dr. John Davidson, pointed out that there was a very small area of the apex of one of the papillæ which had lost its gloss and looked granular; it was not larger than the head of an ordinary pin. It was sent for a microscopical section and the finding is depicted in the drawing shown representing a cavernous angioma.

The kidney was unfortunately destroyed, but the picture shown of a kidney from Stieda's case much resembles it. The patient has remained well up to the present time and has had no more hæmaturia.

DIAGNOSIS.

Not only was it impossible to diagnose the angioma before operation but, owing to its small size, it was very difficult to be sure of its presence after the kidney had been removed, and the question naturally occurred to me as to whether all these cases of unexplained essential hæmaturia are not due to minute angiomata.

I have twice removed the kidney since then for unilateral kidney bleeding and the most careful investigation has failed to reveal any angioma.

CASE RECORDS.

The following is a tabulated list of the cases I have been able to collect:—

Date	Name	Sex	Age	Side	Remarks	Result
1897	Morris	F.	23	Left	Autopsy: multiple. One ulcerating into pelvis	Death from cellulitis of neck
1902	Fenwick	F.	40	Right	Nephrectomy	Recovery
1913	Newman	—	—	Left	Nephrectomy	Recovery
1921	Baum	M.	22	Left	Nephrectomy	Recovery
1922	Swan	M.	19	Left	Nephrectomy	Recovery
1922	Sennels	M.	35	Left	Nephrectomy	Recovery
1922	Burgess	—	—	—	Wedge incision	Recovery
1923	Simpson	F.	30	Right	Nephrectomy	Recovery
1924	Wheeler	M.	57	Left	Nephrectomy	Recovery
1924	Stieda	M.	29	Right	(? arterial nœvus) Nephrectomy	Recovery
1924	Kidd	M.	19	Right	(calcareous deposits) Nephrectomy (double ureter)	Recovery
—	Lutz	M.	62	Right	Nephrectomy	Recovery
—	Deanesly	M.	66	Left	Nodule removed from surface of kidney	Recovery (incomplete)
—	Mayo Clinic.	Only one case recorded: no details; communicated to Wheeler by McCarty				
—	Israel	F.	50	—	Hæmaturia cured by nephrotomy. (Other nœvi on body)	Recovery

Simpson: *Angeioma of the Kidney*

I believe that Mr. Hurry Fenwick was the first to call attention to the clinical importance of this cause of hæmaturia; in his "Clinical Cystoscopy" (1904), he gives details of no less than six cases of "angeioma or capillary nævus of a renal papilla"; the occurrence of so many cases in the practice of one surgeon between the years 1898 and 1904 at first gives the impression that this affection is not uncommon; in two of the six cases, however, the existence of a nævus was only inferred; and in three others the pathological reports show that the condition could not fairly be termed angeioma. In the one remaining case a nephrectomy was performed for the hæmaturia and there can be no doubt about the pathology; an excellent plate of the kidney and two photographs of the microscopical sections are printed.

TREATMENT.

I feel that removal of an otherwise healthy kidney for a minute nævus of a papilla may well be characterized as a surgical iniquity and I should welcome criticism on this subject.

My reason for so doing is that on at least three occasions, when I have split open the kidney from one pole to another, I have had to perform an emergency nephrectomy for really alarming hæmorrhage; of course, many cases so treated do perfectly well, but I think it a surgical calamity from the patient's point of view to have to submit to a second operation within a few days of the first. Moreover, I have been struck with the damage done to the kidney by this method of exploration as the next illustration exhibited shows; with these multiple infarcts, the value of the kidney must be seriously diminished; in my particular case of angeioma I doubt whether by this method we should ever have found the source of the bleeding. As long as a clamp is on the pedicle, the nævus will not bleed but if the clamp is removed the whole field becomes swamped with blood.

I am certain that the reason for these secondary bleedings is blocking of the ureter by clot and the bursting apart of the two halves of the kidney by the increased pressure. I tried on one occasion to avoid this by introducing a drainage tube between the cut surfaces of the kidney, but this course was not successful.

Of the fourteen cases I have collected, no less than ten were treated by nephrectomy; one, by wedge excision, one by nephrotomy and in two the method was not mentioned. There are two other methods which have been tried with success but they do not appeal to me; cases are recorded in which the surgeon has treated unilateral hæmaturia (possibly due to angeioma) by decapsulation of the kidney or by washing out the affected pelvis with weak silver nitrate; our only chance of removing a tumour of the kidney before it is too late seems to me to lie at present in an early exploration of these cases of so-called essential hæmaturia.

On the whole, if ever I have to deal with another case of this kind, I shall be inclined to err on the safe side and carry out a nephrectomy; but this is equivalent to laying down the law that the treatment of essential hæmaturia is removal of the affected kidney.

Sections of Medicine, Surgery, and Laryngology.

Chairman—Dr. HUGH THURSFIELD, President of the Section of Medicine.

DISCUSSION ON THE TREATMENT OF CHRONIC NON-TUBERCULOUS INFECTION OF THE LUNGS.

Dr. L. S. T. BURRELL (Section of Medicine).

I PROPOSE to confine my remarks to the following three conditions :—(I) Bronchiectasis. (II) Abscess of lung. (III) Pneumomycosis.

(I) *Bronchiectasis*.—Treatment must depend on the severity of the disease. Sometimes it is most offensive, but in a mild case it may cause the patient little, if any, inconvenience, and the treatment must not expose him to greater risk than the disease.

To sum up the treatment :—

(1) Look for the cause, and if possible remove it, e.g., foreign body.

(2) Try simple means first. Drainage by posture is often sufficient to cure. Creosote is the most useful of the drugs, and is best given by inhalation in a creosote chamber.

(3) Artificial pneumothorax is successful if the disease is unilateral and the lung can be collapsed. Usually, however, there is too much adhesion of the pleura. Phrenic evulsion has been done where pneumothorax alone has not been sufficient, and especially where there is much adhesion to the diaphragm, but in my cases this operation has not proved of great value.

(4) Aspirate and wash out the bronchiectatic cavities through a bronchoscope. In expert hands this method has given very good results.

(5) *Thoracoplasty*.—In a few cases I have seen excellent results from this operation, but in the majority I have been most disappointed, and I do not think it should be lightly undertaken.

(6) Drainage by opening one or more bronchial cavities.

(7) *Partial lobectomy by cautery*.—This seems a very promising operation, but it is still in its infancy, and I shall be interested to hear surgical opinions on it.

(8) *Pneumolysis*.—The lung around the diseased area is collapsed by stripping the pleura and inserting wax or fat, but it has not proved very successful.

(9) *Lobectomy*.—This has been done, but is extremely dangerous.

(II) *Abscess of Lung*.—An acute abscess often yields to simple treatment—rest, healthy conditions, posture, etc., but if it does not improve in a month I should advocate artificial pneumothorax. Nearly all my cases so treated have done very well. It is important not to wait too long before collapsing the lung, or adhesions will have formed. The collapsed lung may be allowed to re-expand after a few weeks; if symptoms return it should again be collapsed. After a time it will be possible to allow the lung to re-expand without return of symptoms. In one of my cases in which artificial pneumothorax failed, the patient made a good recovery after partial thoracoplasty.

(III) *Pneumomycosis*.—Some think that these cases are not very uncommon, and frequently complicate chronic pulmonary disease. I have, however, had the sputum examined in a large number of cases and I think that the yeast cells so often seen come from the mouth and not from the bronchi or lung tissue, except in very rare instances.

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Fungi may cause disease in the lung and authentic cases have been described. Recently I saw a patient with signs and symptoms of pulmonary tuberculosis. The X-ray appearances, however, did not suggest tuberculosis, but showed coarse mottling in the middle of the lung like that in secondary carcinomatosis of lung. No tubercle bacilli were seen in the sputum, which had been frequently examined, but mycelia were always present. The diseased lung was collapsed. Large doses of potassium given and the patient made rapid improvement.

MR. A. TUDOR EDWARDS (Section of Surgery).

Those portions of this subject which are chiefly of interest to the surgeon consist of the group of suppurations, and certain of these I shall discuss under three main groups.

These are: (1) Chronic simple abscess of the lung, (2) chronic bronchiectatic abscess, and (3) bronchiectasis.

(1) CHRONIC SIMPLE ABSCESS OF THE LUNG.

Chronic simple abscess consists of a localized suppuration in the parenchyma of the lung, not communicating at first with a bronchus and surrounded by an area of chronically inflamed solid lung tissue.

The X-ray appearance is characteristic, showing a localized area of opacity. When communication with a bronchus has occurred the central area of the shadow is often less dense than the periphery and, in the erect posture, may show a fluid level with air above.

No attempt should ever be made to confirm the diagnosis by needle aspiration unless it is certain that the pleuræ are adherent.

Lipiodol rarely enters the cavity owing to mucosal swelling in the communicating bronchus.

Treatment.—As the condition is chronic we may infer that ordinary treatment has failed and that more radical measures are now indicated.

(a) *Artificial pneumothorax* may be valuable in some cases, but is more useful at an earlier stage. It should be attempted when the abscess is near the hilum, as in these cases the risk of drainage is increased on account of the large vessels. When the abscess is at the periphery, artificial pneumothorax may break down recent adhesions and cause secondary infection of the pleura.

(b) *Pneumotomy.*—Drainage of the abscess to the outside is the ideal treatment. It should be done under local or intratracheal anæsthesia.

Drainage occurring through the bronchus is rarely adequate owing to the swelling of the mucosa of the communicating bronchus. It may be supplemented by repeated aspiration through a bronchoscope if the abscess is close to the hilum.

External drainage should be undertaken only after very careful localization of the abscess by skiagrams in several directions, and the opening should be made at the point nearest the surface. The operation is done in one sitting when the pleuræ are adherent; in two stages—localization and packing of iodine gauze over the pleura, and pneumotomy four or five days later—when the pleura is free. The incision should be vertical over the ribs to allow a portion of a rib above or below to be resected when necessary. In order to allow easy closure of the drainage track it is advisable to make it somewhat oblique through the thoracic parietes at the original operation.

Three to four days after drainage there are almost invariably obvious signs of bronchial fistula, owing to subsidence of the inflammatory swelling in the communicating bronchus. Drainage is usually required for four to six weeks, i.e., until there is almost no discharge except from the track itself.

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The larger abscesses, as healing occurs, give rise to considerable fibrosis and often therefore to secondary bronchiectasis. In order to complete the cure and to get rid of all expectoration it will be necessary in certain cases to perform phrenic evulsion so as to diminish lung capacity on the affected side, otherwise thoracoplasty may be required later. The non-realization of this fact has been responsible for a good deal of permanent ill-health following surgical drainage of pulmonary abscess.

During the last twelve months I have operated upon six cases of chronic simple abscess. Five have been drained externally, and, apart from one under treatment, and doing well, all are cured. Two required subsequent phrenic evulsion before complete disappearance of the sputum and cough. The youngest patient was a child of seventeen months. One case with an abscess situated near the hilum was bronchoscoped, and removal of a portion of granulation tissue with a small area of cartilage resulted in complete and rapid emptying through the bronchus, with subsequent cure.

(2) BRONCHIECTATIC ABSCESS.

This variety consists of a multiloculated abscess cavity, often in the lower lobe and communicating with several bronchi. Foreign bodies may be the causative factor.

X-rays show an irregular shadow at the base, but lipiodol injection clearly demarcates the abscess and communicating bronchi.

Treatment.—These cases should all be primarily investigated by the bronchoscope to eliminate the presence of a foreign body. Continued lavage is not satisfactory except in a few cases. Pneumotomy has been fairly encouraging and accounts for the success of drainage operations in some cases described as bronchiectasis. Artificial pneumothorax is not likely to prove of much value here owing to adhesions. Pneumotomy should be done in one or two stages as in simple abscess but should be planned as a much more extensive procedure. A large area of overlying chest wall, consisting of portions of ribs and intercostal structures, should be removed. The site of the abscess is then confirmed by the exploring needle and the main cavity opened by cautery. The whole of the outer wall of the cavity is removed by cautery and vessels crossing the cavity are ligatured. All pockets are made to communicate directly with the main one and the whole cavity is lightly packed, care being taken that no gauze gets into the communicating bronchi.

If the operation is properly completed and free drainage of all pockets established gradual obliteration of the cavity occurs. Subsequent phrenicotomy or thoracoplasty may be required to close the cavity.

Meyer has attempted to establish a permanent fistula between the cavity and the outside by keeping up the drainage until the track has become lined by skin—the lung-lip fistula.

(3) BRONCHIECTASIS.

The causes of bronchiectasis are manifold and the only concern we have with them here is the effect of treatment.

The value of X-rays in the diagnosis cannot be exaggerated. Opaque foreign bodies can be seen, and the effect of the blocking of bronchi by non-opaque foreign bodies can be judged by the variations of translucency of the lung. Lipiodol injection into the trachea and bronchi makes diagnosis certain and is invaluable for the information it gives as to the extent of the disease.

Bronchoscopy should be performed as a routine in all cases, and foreign bodies,

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when present, extracted. Bilateral cases limit the scope of surgical treatment to a great degree and hence the likelihood of benefit is diminished.

Two surgical measures may be adopted. First, regular evacuation of the dilated bronchi by way of the bronchoscope followed by instillation of antiseptic solutions. Secondly, the operation of bronchostomy—the artificial production of a bronchial fistula, which acts as a means of draining the bronchial tree and, in addition, allows improved aeration of the infected area. Lillenthal records one case of advanced bilateral disease cured by this method except for the persistence of a small bronchial fistula.

Unilateral cases have, in the past, been treated in several different ways:—

(a) Artificial pneumothorax; even when complete, this is unlikely to be of permanent benefit except in the very early stages.

(b) Drainage through the chest wall is very unsatisfactory and has been abandoned as a surgical measure.

(c) Bronchial lavage by way of the bronchoscope has proved of more value during the earlier stages and, in a proportion of cases, may give rise to considerable improvement if not to cure.

(d) Bronchostomy is rarely adequate though it may result in marked amelioration in a few cases.

(e) Phrenic avulsion, of which my experience consists of twenty cases for bronchiectasis, generally leads to diminution of sputum or fætor, or of both. I have yet to see a cure of an established case of bronchiectasis by this operation.

Thoracoplasty.—The collapse of the chest wall by extrapleural resection of the paravertebral portions of the 1st to 10th or 11th ribs, would be expected to lead to considerable collapse of the underlying lung. Unfortunately, the affected areas will not in all cases collapse owing to their rigidity. Cavities in the periphery of the lung can often be made to collapse, while those near the hilum remain unaffected.

However, in eleven cases of thoracoplasty for bronchiectasis, without operative mortality, four are virtually cured, one recent case has less than 1 oz. of mucoid sputum daily, two are definitely improved. Two patients died subsequently, one several months and one two and a half years after operation, and two have had other operations later.

The operation shows the best results in bronchiectasis secondary to pulmonary abscess and empyema, or following traumatic fibrosis. Those cases, however, of whatever type, which show temporary good results after artificial pneumothorax, are likely to exhibit equally good and permanent results under treatment by thoracoplasty.

Pneumectomy by Cautey.—This operation, advocated and practised by Graham in America, consists in the exposure of the affected area by removal of the overlying chest wall and destruction of the affected portions of lung with the cautery in several sittings. There appears to be danger of secondary hæmorrhage.

In two cases I have adopted this method under local anaesthesia. In one there was extensive disease in the opposite base which caused death some four or five months afterwards. The other patient, who at first was gravely ill and expectorating two pints of foul sputum daily, is still under treatment, after two cauterizations, with the sputum reduced to 12 oz. daily.

Lobectomy.—Lillenthal has recorded a large series, but the mortality appears to be over 50 per cent., due chiefly to sepsis and shock. My solitary experience with this operation resulted in death, sixteen hours afterwards, from extensive intra-auricular clotting. Lobectomy certainly appears the ideal procedure when further improvement in the technique has reduced the mortality sufficiently to warrant its more general adoption.

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Mr. G. EWART MARTIN (Edinburgh) (Section of Laryngology).

BRONCHOSCOPY.

Bronchoscopy as a form of treatment is still in the experimental stages.

It is only about twenty-five years since the trachea was first directly inspected in the living subject; consequently, only very recently has the treatment of infections of the chest by means of a bronchoscope been suggested.

However, with the perfection of the armamentarium of the endoscopist and the simplification of the bronchoscopic examination along, with the entire absence of risk, it is becoming increasingly clear that examination of the chest is incomplete without an endoscopic report.

(1) Bronchoscopy, therefore, in the first place must be considered as an aid to the physician and surgeon.

As an aid to the surgeon it bears much the same relation to the surgery of the chest as cystoscopy bears to the surgery of the kidneys and bladder. If the physician or surgeon finds blood or pus in the urine, he at once wishes to know whether this is from the bladder itself or from one or other kidney. With the cystoscope one can at once explore the bladder and orifices of the ureters in the outlook for disease. So is it possible with the bronchoscope to bring into direct vision the trachea, both main bronchi and the smaller bronchi, with the exception of the upper part of the right bronchus of which the orifice only can be seen, so that any exuding secretion can be inspected. With the bronchoscope, too, it is possible to obtain uncontaminated swabs direct from the lower air passages for bacteriological report. It is possible to remove specimens of inflammatory or neoplastic tissue for histological examination, and a thorough inspection of the movements of the bronchi gives us an idea of the condition of surrounding parts, such as peribronchial thickening or fibrotic changes in the lung. Bronchoscopy, for diagnosis in the hands of the endoscopist, is a harmless procedure causing no ill effects to the patient, no anæsthetic being required except for a slight spraying of the epiglottis with cocaine.

Bronchoscopy is also an aid to the radiologist. In the taking of pneumonograms, bismuth or lipiodol can be injected directly through the bronchoscope into the part of the chest involved, so that there is a more definite localization of the areas to be outlined instead of the appearance of a splashed shadow in the X-ray film here and there throughout the whole of the lower air passages, as happens when lipiodol is introduced perorally or through the crico-thyroid membrane.

(2) Again, as many bladder conditions can be treated simply by cystoscopy, so also many chest conditions can be handed over to the endoscopist for treatment, e.g., cases of bronchiectasis or lung abscess, for the aspiration of the pus lying stagnant in the cavities, or for lavage or medication of the cavities themselves.

In non-tuberculous diseases of the lungs, the bronchoscope is a valuable means of localizing any pathological condition, even the particular bronchus or the lobe of the lung involved.

Foreign Bodies.

There are some who believe that the great majority of chronic non-tuberculous infections of the chest are due to inhaled foreign bodies. It is strange how in the bronchoscopic clinics in America so countless a number of foreign bodies in the bronchi should be discovered, while in this country the records are so few that for some years almost every individual case has been published. It can only be surmised that the possibility of the presence of a foreign body is too often overlooked by the examining physician or surgeon in cases of diseases of the lung.

The removal of a foreign body from the lungs in these cases effects a cure in 90 per cent. of its accompanying infections.

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The difficulty of diagnosis is illustrated by the following two cases:—

Case I.—A. J., male (43). Diagnosis, tubercle of lung; definite signs of cavity in left lower lobe but no tubercle found in sputum on ten to twelve examinations. At the request of the physician the lungs were examined by the bronchoscope. The posterior part of the lower left lobe was found to be blocked with a piece of woolly material, probably from the blankets. On this being removed, all signs of cavity formation disappeared. The patient went home against the wishes of the medical staff and developed influenza, from which he died.

Case II.—J. S., male (34). Sent to hospital with a history suggestive of a foreign body in the chest, coughing up blood-stained sputum, malaise, etc. Chest examined in the Medical Out-Patient Department and said to be free from symptoms. No X-ray taken. Patient seen four months later at the Ear and Throat Department with still the same symptoms and occasional blood-stained sputum and flakes of pus. X-ray Department reported no signs of a foreign body in the chest. Physician diagnosed a slight right-sided bronchiectasis. Bronchoscope passed; a mutton-bone was removed from the right bronchus, measuring 1 in. by $\frac{1}{2}$ in. by $\frac{1}{16}$ in. Recovery complete.

Contra-indications to bronchoscopy in the treatment of diseases of the chest.—These are very few:—(a) Recent hæmorrhages call for postponement of bronchoscopy; (b) high fever with its accompanying prostration demands in most cases postponement; (c) concurrent severe heart infections may preclude bronchoscopy as it does any type of operation; (d) the patient who shows all the signs of an acute toxæmia is, of course, beyond bronchoscopic aid.

Bronchoscopic Drainage.

In a paper read before the Section of Laryngology of the American Medical Association in 1924, Chevalier Jackson suggested that the theory of all bronchoscopic aspiration and treatment is founded on the impairment or inefficacy of natural pulmonary defence, that is, (1) the cough reflexes, (2) ciliary activity, and (3) germicidal action.

Compression of the lungs during a cough forces the secretion from the periphery of the lung, but it is the ciliary action that plays the greater part in upward drainage. The action of the cilia is overcome by gravity. In inflammatory tissue, in scar tissue such as we get when a lung abscess bursts into the bronchus or in the dilated bronchus in a case of bronchiectasis, there is no ciliary action and a consequent stagnation beyond. The patient is gradually drowned in his own secretion. Postural coughing has been tried, gravity helping the cilia, but the forced coughing, even in the upside-down position, will not empty cavities, viz., the lung abscesses or partially occluded bronchiectatic cavities.

By the use of the bronchoscope any cavity within reach can be sucked entirely dry, and in many cases its walls collapsed. Bronchoscopic drainage is better than natural drainage.

Instead of leaving infective material to incubate in the bronchus, we should remove it bronchoscopically by aspirations, or in the more chronic cases by lavage and aspiration. Here, again, the bronchoscopic treatment is practically free from risk; no general anæsthetic is required and the whole operation is completed under twenty minutes.

Pulmonary Abscess.

In the treatment of lung abscess I have had no experience, except in one case.

In a symposium on lung abscess in the hospital of the University of Pennsylvania, reported in the *American Journal of Roentgenology*, Gabriel Tucker, of the Bronchoscopic Clinic (although he does not give figures), says that under bronchoscopic treatment many patients are improved, many are cured, and none are made worse. In a few cases definite localization of the lesion rendered the abscess more accessible to external drainage.

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In the case I examined there was a gangrene of the middle right lobe. For five days after aspiration the patient improved remarkably, but unfortunately died suddenly from a septic embolism.

The bronchoscope is useful in the localization of circumscribed lung abscesses, though in these the external operation is the only means of treatment.

Bronchiectasis.

In 1922 I had the first opportunity of treating a case of bronchiectasis by aspiration and lavage, and the results were so extremely satisfactory and the relief to the patient so remarkable, that I was encouraged to continue this method of treatment though, to begin with, it was largely experimental. One has to depend for cases on the generosity or despair of the physician. Cases apparently symptomatically similar do not respond to the same type of treatment. Each case must be taken individually, and though the percentage of cures is naturally small, as it is only the chronic type of case that is presented for treatment, yet the effect on the patient, on relieving him of dammed up septic material, urges one to persevere.

Altogether, I have now examined and treated thirty-one cases of bronchiectasis. The method adopted has been to carry out as complete an aspiration as possible, using a fairly strong pump attached to the aspirating bronchoscope, with a vacuum suction pump on a two-way cannula passing through the bronchoscope into the cavity. When the cavity is thoroughly aspirated and the pus removed as far as possible, the cavity is washed out with weak boracic solution and dried. In most cases it is afterwards swabbed with spirit.

There have been, up to the present, nine cases of cure. Three cases were cured by one aspiration; one of these I do not think was a true bronchiectasis; though diagnosed as such by the physician, it showed only a slight bronchiectasis.

Two cases were cured after three treatments. In one of these the patient, A. D., aged 21, who also received an autogenous vaccine from a swab taken directly from the cavity, actually put on 4 st. in weight during the period of treatment. One patient, C. N. (whom I have included under the "cures") had a right-sided cavity which cleared up after four aspirations, but two months after the last examination he developed left-sided lobar pneumonia, from which he died, the right lung remaining absolutely clear. One case with a cavity on the left side, with a curious stricture, cleared up after five aspirations over a period of two months, and still another with signs of bronchiectasis in both sides cleared up entirely after six aspirations. In the case of Miss C., with a large right-sided cavity following the swallowing of a tooth during dental extraction, the cavity remained perfectly dry, there was no sputum and no odour from her breath for some time after six aspirations. Unfortunately she developed encephalitis lethargica, from which she died, but during her illness she showed no signs of any recurrence of the bronchiectasis.

* There have been three cases of entire failure. In one case the whole of the right lung was involved, and it was impossible to overcome the flow of pus on aspiration. One week after the second examination an open operation was suggested with a view to collapsing the right lung, but the patient, a male, died under the anæsthetic.

The other two cases of failure were similar, there being present multiple cavities with very evident toxæmia. Owing to the weak condition of the patients a second treatment was not carried out. Of the remaining nineteen cases, two have been lost sight of. Another patient, who was certainly improving under treatment, developed a fatal uræmia shortly after the fourth aspiration.

The other sixteen cases are still under treatment, and all the patients have shown marked improvement. Two cases may be specially mentioned; in both there were cavity formations in the lower and upper lobes on the right side. In both cases the secretion from the lower lobe cleared up entirely, one after two and the other after five aspirations. The cavities are still present in the upper lobe, and it is only lately, with the use of a special Jackson suction tube with a spring end which can be inserted into the eparterial bronchus, that we have been able to aspirate the upper right lobe with excellent results.

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TABLE OF CASES.

Name	Age	Physician's diagnosis	Bronchoscope examination	Treatment	No.	Result
E. S.	26	Bronchiectasis	Small dilatation lower left posterior bronchus	Lavage and swabbings	1	Cure. No further cough or foul sputum.
M. P.	11	Do.	A good deal of peribronchial thickening, slight dilatation left posterior bronchus	Lavage ...	1	Cure. No further cough or foul sputum.
C. A.	12	Do.	Peribronchial thickening: no true cavity formation	Lavage ...	1	Cure.
A. D.	21	Do.	Large cavities both lower posterior bronchi	Lavage and swabbing with spt. vin. rect.	3	Cure.
A. J.	30	Do.	Bilateral small dilatation lower bronchi	Do. do.	3	Cure. Put on 4 st.
H. O.	32	Left bronchiectasis	Very large dilatation of left lower bronchus: practically shut off with stricture above which had to be dilated	Lavage ...	5	Cure. No further cough.
F. N. D.	24	Bronchiectasis	Dilatation of right lower bronchus with very foul pus: slight recurrence of symptoms after third lavage	Lavage ...	6	Cure. No cough apart from occasional crepitation, chest free.
E. C.	40	Right bronchiectasis following swallowing of tooth which was coughed up	Dilatation of right bronchus ...	Lavage ...	6	Chest cleared up; no cough; no sputum. Died later from encephalitis lethargica. No recurrence of chest condition during illness.
C. N.	42	Right side bronchiectasis	Large cavity left lower lobe ...	Lavage and swabbing	4	Cleared up. Developed left lobar pneumonia two months after last treatment. Died. Right side not involved.
H. M.	14	Right bronchiectasis	Very free flow of pus. Evidently multiple cavities	Aspiration ...	1	Operation for collapse of lung suggested. Boy died under anæsthetic.
J. G.	28	Do.	Very large cavity. Suggestive of old-standing lung abscess bursting into bronchus	Do	1	Improved for two or three days only. Further treatment inadvisable. Patient died one month later.
E. G.	16	Bilateral bronchiectasis	Boy very toxic. Multiple dilatations with very foul pus	Do.	1	Treatment not continued. Patient too ill. Died three weeks later.
J. H.	40	Left bronchiectasis	Large dilatation left posterior bronchus, also cavities in left upper lobe	Aspiration, lavage and swabbing with spt. vin. rect.	3	Very much improved, able to return to work. Still under treatment.
L. W.	27	Bilateral bronchiectasis	Dilatations bronchi both sides	Do. do.	2	Improved very markedly. Unfortunately developed influenza from which he died.
J. W.	29	Left bronchiectasis	Definite cavity formation left side, large dilatation of postero-inferior bronchus	Do. do.	6	Improved to begin with, but has been stationary for last three months.
J. W.	39	Right bronchiectasis	Large dilatation of right bronchus with excoriation of the mucous membrane above the bifurcation of the right bronchus. Bleeding very easily	Aspiration	2	Patient improved slightly, but amount of bleeding does not allow of frequent aspirations.

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W. A.	24M.	Do. ...	Very large dilatation of left lower posterior bronchus, appearance as of old-standing lung abscess	Aspiration, lavage and swabbing	8	Very much improved. Fit to carry on his work. Put on weight.
R. R.	24F.	Do. ...	Cavity left lower lobe ...	Do. do.	2	Very much improved. Practically no sputum.
Mrs. C.	25	Left bronchiectasis ...	Dilatation of lower bronchi right. Pus oozing from eparterial bronchus right	Do. do.	9	Lower lobe entirely cleared, with new apparatus now washing out eparterial bronchus. General health very much improved.
Mrs. R. H.	24F.	Do. ...	Do. do.	Do. do.	3	Do. do.
M. M.	31F.	Do. ...	Very large cavity left lower lobe	Do. do.	7	Improved rapidly until three weeks ago when bad cold developed. Cavity got partially closed. Large amount evacuated. Last bronchus four days ago giving great relief.
J. B.	10M.	Do. ...	Multiple dilatations ...	Do. do.	8	Much healthier. Attending school.
W. S.	25	Bilateral bronchiectasis	Cavities both sides, very large cavity left	Do. do.	2	Improved under treatment.
J. F.	—	Do. ...	Marked dilatation lower bronchi, both sides	Aspiration ...	1	Improved after treatment.
J. B.	26	Do. ...	Small cavity left, larger cavity right side, both towards middle line	Do. ...	1	Improved very much under treatment.
A. C.	16	Left bronchiectasis ...	Large cavity posterior left lower bronchus	Do. ...	2	Very much improved. No odour from breath when last seen. Got signed off for six months.
F. J.	49	Right side bronchiectasis ...	Curious dilatation of outer right lower bronchus with pus exuding from it	Aspiration and lavage	9	Very much improved under treatment.
E. N.	18	Left bronchiectasis ...	Large dilatation of both small bronchi left side with pus	Aspiration and lavage with spirit	4	No pus now coming from medial cavity; still large dilatation of outer bronchus.
I. M.	39	Do. ...	Pus oozing from outer bronchus, left side good deal of bleeding, suspicion that foreign body was present.	Aspiration ...	1	Patient very much better under treatment. Patient left country and lost sight of.
I. L.	57	Do. ...	Large cavity left lower lobe towards middle line	Aspiration and lavage, swabbing	4	Very much improved. Developed uræmia from which he died.
J. C.	21	Do. ...	Extensive dilatation medial left lower bronchus	Aspirated ...	1	Under treatment.

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The gratitude shown by the patients in all the cases after simple aspiration and lavage is remarkable.

The percentage of cures is not large. But in all cases, after the removal of stagnant foul secretion from the lungs where postural coughing has entirely failed, the patient obtains immediate relief, cough is minimized, the accompanying foul odour of the breath disappears, and the life of the patient thus being made endurable.

Therefore with the use of the bronchoscope we have a therapeutic means and an aid to physician and surgeon that cannot be disregarded in the treatment of chronic non-tuberculous diseases of the chest.

Dr. K. DOUGLAS WILKINSON (Section of Medicine).

BRONCHIECTASIS.

Ætiology.

No consideration of treatment can be complete without a review of causes, for "prevention is better than cure." Of that form of bronchiectasis which may result from the aspiration of a foreign body, or which may follow an operation on the nose or throat as a more or less acute condition, I have no experience, although from reading an American text-book or essay on the subject of bronchiectasis one would gather the impression that almost all cases result from tonsillectomy or from some similar operation. Dr. Myerson, of Brooklyn, with the bronchoscope, showed that 79 per cent. of patients examined immediately after tonsillectomy had aspirated some blood into the bronchi and suggested therefore that aspiration was the cause of the numerous cases seen following this operation. On this side of the Atlantic, however, most cases of bronchiectasis seem to begin in childhood, (a) either as the sequel of influenza or pneumonia, (b) where something has prevented the normal resolution of the affected lung, (c) where either some complication, such as pertussis, has been present, or as the result of repeated attacks of bronchitis. Hospitals furnish far more cases than private practice, and this fact raises the question of the importance of infections of the teeth, the tonsils, or nasal sinuses as ætiological factors. For these infections are certainly more usual among the poorer classes of town-dwelling children, and it is common knowledge that the infection of a middle ear is often associated with delayed resolution in a pneumonic lung.

Diagnosis.

In well-marked cases this may present no great difficulty, but after all there is no definite dividing line between bronchiectasis and bronchitis; a recent case of mine illustrates the difficulties of diagnosis peculiarly well.

The patient, a man aged 25, had had attacks of bronchitis from childhood, but he had served for four years in the Army, and had been apparently in fair health until September, 1926, when he had influenza. At that date he began to bring up large quantities of foul-smelling sputum and to lose weight. Postural drainage caused him to evacuate about 7 oz. of extremely offensive pus, yet an injection of lipiodol failed to show any dilatation of the bronchi. He has done remarkably well on creosote inhalations and repeated emptying of his bronchi by posture. The introduction of lipiodol is certainly a great advance, for it enables us not only to make our diagnosis with accuracy, but to determine the site and character of the disease.

The milder cases, especially in children in whom the condition is not of long standing, and where symptoms are intermittent and general disturbance slight, as a rule do well. Since these cases are of medical interest I propose to consider them briefly.

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Treatment.

Three measures seem to give good results; which is the most important I hesitate to pronounce. They are: (1) Postural drainage; (2) creosote inhalations; and (3) vaccine therapy.

(a) *Postural drainage.*—It is comparatively easy to invert a child and make him cough up the contents of his bronchi. This alone in some cases seems to be sufficient if conscientiously carried out two or three times a day for a sufficient period, but there is considerable difficulty in persuading the parents to do this for long, and the child himself often possesses a strong, not unnatural, aversion from the method, and may even go to some pains to persuade his parents that the treatment is unnecessary, that he has no secretion to bring up, or that he has already emptied his bronchi unaided.

(2) *Creosote inhalations*, or Lee's drops, inhaled from a Burney-Yeo's mask, are usually accepted by the patient more readily, because these inhalations seem to diminish the amount of bronchial secretion and cause very little personal inconvenience. But even then difficulties arise in persuading patients to use the mask for many hours by day or night and to continue the treatment for a sufficient length of time. The personal appearance, work, etc., may interfere with this form of treatment in spite of the patient's recognition of its beneficial effects.

(3) *Vaccines.*—I have only used these in a few cases, but I have been particularly struck by the effect of a vaccine in a suitable case. In one case I have seen definite clubbing of the fingers disappear.

This patient was a boy, aged 9, whose circumstances were good, so that he was compelled to carry out treatment efficiently and was enabled to have a long seaside holiday in addition to his taking vaccine. Twelve months after treatment began his expectoration had disappeared and a year later he had no appearance of clubbed fingers and neither symptoms nor physical signs of the condition.

Of artificial pneumothorax as a means of collapsing the dilated bronchi I have only a limited experience and as neither of the cases in which I have tried it seemed to benefit materially I have not used it since. I suppose that the difficulty was to collapse the denser fibrotic areas at the base of the lung where the bronchi were dilated and to keep the pneumothorax sufficiently large to effect this object. In any case I certainly failed, and I am very doubtful whether it is a method which offers real hope of effective treatment. Possibly it might be of avail in slighter cases, but I have never dared to advise or try such a method of treatment in cases which I felt sure would do well under application of simpler measures.

I have some experience of the surgical treatment of the more advanced cases, for I have had several patients operated on.

The first was a patient who had one large cavity which was drained. Fortunately his lung was adherent to the chest wall. He made a remarkably good recovery, and after nearly ten months of drainage his sinus healed and has remained healed. Two others have been those of children. In one an attempt was made to excise a lobe, but the surgeon modified his procedure on account of hæmorrhage—the operation was unsuccessful. The third has been treated by Graham's method of cauterizing the lung with a large electro-cautery. This seems to have given good results from the point of view of general health, but has not yet been sufficiently thorough to cure the condition or open the enlarged bronchi. This cauterization has now been done on three occasions. At the first operation the lung was found non-adherent to the chest and the pleura was fixed to the chest. The lung was then cauterized and left to heal. At the third operation the lung was cauterized more deeply.

The first operation was productive of a considerable degree of shock. The second and third have been done easily with light anaesthesia and without the slightest disturbance to the child, who goes back to the ward and eats a good meal immediately afterwards. In time no doubt it will be possible more or less to extirpate the

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affected lung, but as this would be a lengthy process it would be a great advance if some safe, but more speedy, method of dealing with the diseased lung could be devised.

In France, Mr. Gask, with whom I worked, always accused me of a touching faith in surgery. I take it that this was a compliment, but it is true that I believe that these more serious conditions are necessarily surgical, and that their treatment and cure will only be achieved by the extirpation of the affected tissue—the means and the methods by which this is to be carried out belonging to the department of the surgeon.

Mr. C. A. S. RIDOUT (Section of Laryngology).

The treatment of chronic non-tuberculous infections of the lungs from the laryngologist's point of view has been, in one's own experience, somewhat limited by the fact (1) that physicians have only recently begun to ask our help, and (2) that in certain areas of this country only a small number of cases occur in medical practice, according to the physicians' statements. My experience has thus been limited to chronic bronchiectases, and I shall briefly mention some points in the technique I have adopted.

The cases which so far appear to benefit from bronchoscopy are those in which a radiograph shows a definite bronchiectatic area in one or both lungs.

The radiographs show the case of a lady completely incapacitated by a bronchiectasis of the middle lobe of the right lung. She coughed up very foul pus, there was a swinging temperature and she was confined to bed with emaciation and prostration.

Under local anæsthesia, a series of bronchoscopies were performed, at first every few weeks and later at longer intervals as she improved. For the first two or three occasions suction only was employed, a large amount of foul pus was evacuated from the middle lobe of the right lung, and it was seen to well up from a bronchus entering this lobe. Subsequently lavage was employed on several occasions and once one or two drachms of argyrol, 10 per cent. solution was run in.

The patient improved rapidly from what was practically a dying condition. Though she suffered considerable exhaustion after the bronchoscopy, the temperature steadied and fell to normal, her strength and weight increased and she was able to go for a summer holiday and enjoy motoring. She still coughs up pus, but this is much less in amount and is not so foul. She comes to me now about once a month for suction and lavage, and this seems to be quite sufficient. The radiographs show the improvement in the condition of the middle lobe of the right lung.

With regard to technique, the patient (with a slight predisposition against cocaine which originally seemed to cause much prostration) has her fauces and pharynx swabbed with 20 per cent. novocain for five minutes, then 5 per cent. cocaine is swabbed over the epiglottis and glottis. She lies with head extended, and Jackson's bronchoscope, smeared with 1 per cent. cocaine ointment, is introduced—there is generally some spasmodic cough as the tube is passed into the tracheæ and left bronchus—and 1 per cent. cocaine is applied on a mop holder through the bronchoscope. A water or electrical suction tube empties the right bronchus of pus which is generally present. When pus is seen exuding from the middle lobe bronchus a sucker with spiral spring end which can be made to enter any lateral bronchus after exit from the bronchoscope, is introduced and further pus evacuated. Then after removal of the tubing from the sucker and connecting the latter with an irrigator, and at the same time inserting alongside of it another suction tube, the cavity is irrigated with warm boracic lotion. When the patient shows signs of distress the apparatus is withdrawn, she sits up and coughs out the excess of fluid.

The improvement in this special case encourages me to persevere with the method.

On another occasion I performed the preliminary bronchoscopy and suction under general anæsthetic when the patient did not seem of the type to stand a local

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anæsthetic. My present impression is that it is the emptying of the cavity by suction which is the main factor in improvement, and not so much the lavage, but doubtless as my technique improves the latter part of this treatment will become more important.

Mr. J. E. H. ROBERTS (Section of Surgery)

said that the advanced type of case ought not to occur; it was a confession of the failure of early treatment. Neither the surgeon nor the physician could cure advanced bronchiectasis. Prophylaxis was not sufficiently considered; certain conditions were known to predispose to bronchiectasis, and patients suffering from them were turned out of hospital and not seen again until it had developed. They should be very carefully watched, and measures such as vaccines, avulsion, removal of foreign body and pneumothorax should be carried out early. When the early stages of bronchiectasis had established themselves, the physician, surgeon, radiologist, and bronchoscopist should co-operate as a team. Nearly all cases were unilateral at the beginning. When lipiodol had confirmed the diagnosis and a course of some months' treatment had proved unavailable, the surgeon should be called in. He agreed that phrenicotomy was not curative except in the early stages, but it should always be done as a preliminary to other collapsing operations. It nearly always improved the patient's condition, and so reduced the risk of subsequent procedures. Thoracoplasty had given very good results in early cases, but failed in advanced ones—although it might be of great value as a palliative. Grave consideration must be given before undertaking the dangerous operations of cauterization, with its mortality of 20 per cent., and lobectomy, in which the mortality was 50 per cent. Lobectomy was necessary in cases where there was associated sepsis beyond the limits of the bronchial tree; these did not do well after collapsing operations. The general line of treatment should be surgical crescendo.

He showed slides of a case which had been cured by removal of a collar stud from the bronchus. The man had been X-rayed several times, but always in his shirt and vest, and the stud had been taken for a button.

Dr. F. G. CHANDLER.

To deal with the more spectacular abscesses, bronchiectasis, etc., is comparatively simple, though here we have to trespass very soon on the domain of the surgeons. I am sure that the surgeon will not resent this, for in no part of our work is close co-operation between the physician and the surgeon more essential.

Non-tuberculous fibrosis is usually the result of broncho-pneumonia, common after whooping-cough, more rarely due to occupation, foreign body or pressure on a bronchus. If possible, the cause must be dealt with. Often this is not possible. The general health must be maintained at the highest possible standard in order to avoid infection with an increase of the fibrosis. Unfortunately traction of the fibrous tissue often exerts more influence on the bronchi than on the thoracic wall, causing bronchiectasis. If the condition is progressive, I believe the treatment should be artificial pneumothorax. This may allow a contraction of the affected side while the bronchi are released from traction, subacute inflammatory processes will subside and the lung may be allowed to expand in a year or two. If this seems inadvisable, 500 or 1,000 c.c. of oil of gomenol might be injected into the pleural cavity. I show slides of a case in which I think the diagnosis was a non-tuberculous fibrosis in a child of 6, though tuberculosis cannot be absolutely excluded. The left lung was affected throughout. Artificial pneumothorax has been induced. I propose to keep the lung compressed for one year.

Bronchiectasis.—The treatment depends on type, localization and extent. Slides illustrate these points:—

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Case I.—An advanced bilateral basal "glove-finger" type can only be treated by palliative measures.

Case II.—A bilateral, rather advanced, lower lobe type. Is treated by postural treatment, creosote by mouth, inhalation in the creosote chamber, with great temporary improvement.

Case III.—A girl aged 12. A unilateral upper lobe type. I am treating by pneumothorax.

Case IV.—A case of a girl, aged 13, where, it will be seen, the disease is extensive in the left lower lobe, but slight on the right. Treatment by phrenic avulsion.

I prefer to try all these methods before proceeding to rib mobilization or thoracoplasty. If a lung can be compressed by artificial pneumothorax, intrapleural injection of oil of gomenol might be considered, but I have not much experience of this. In one case the oil tended to work up to the apex, while the lower lobe expanded.

Lung Abscess.—Some cases, I believe, cure themselves. The slides shown illustrate this. Artificial pneumothorax may be indicated in some cases, but there is risk of empyema. Drainage is the best treatment, but the pleura must be adherent at the site of the operation. If it is not, it must be made so by preliminary packing. If after drainage the walls of the cavity will not approximate, then phrenic avulsion should be performed.

The slides now shown illustrate the case of a boy of 12 who was expectorating over half a pint of foul pus daily. He was very ill and had been considered an incurable case of bronchiectasis. Drainage, followed by phrenic avulsion, effected a cure.

I could give other instances, but cures by drainage are now a commonplace. Not so very long ago, however, there was a great fear of cutting into the lung.

Mr. H. S. SOUTTAR (Section of Surgery).

Both the pathology and treatment of suppurative conditions within the lungs are largely conditioned by mechanical considerations. Suppurative bronchiectasis may originate in some mechanical interference with the bronchi, or in infection of the parenchyma of the lung—as, for instance, after an unresolved pneumonia. In either event a very similar state of affairs ultimately results, for the bronchi become dilated from the weakening of their walls, and obstruction to the egress of air, whilst there is always a greater or less degree of destruction of the lung tissue itself. A ragged abscess cavity may be formed, into which open widely dilated bronchi; or in the more chronic cases the bronchi themselves may form the cavity in which pus collects. In both cases the patient coughs up large quantities of foul pus, and suffers from a severe degree of septic absorption. The problem for the surgeon is the draining of these cavities, and the prevention by adequate ventilation of the growth of the anaerobes for which these cavities provide such a perfect soil.

In the case of bronchiectasis or of pulmonary abscess it is of the utmost importance to exclude the possibility that the whole condition has arisen by purely mechanical means from the inhalation of a foreign body. A small fragment of bone may have been inhaled while the patient was eating, or a tin-tack, or collar stud, or any other small object may have found its way into the bronchus.

During a surgical operation a particle of vomited material, plugs of mucus, or even a fragment of a tooth or a tonsil may be inhaled, and it is probable that a large number of pulmonary complications which follow general surgical procedures arise in this manner. The apparently trivial nature of the accident is in striking contrast to the gravity of the condition which may follow, and the importance of the removal of the primary cause is shown by the remarkable way in which those cases clear up if the mechanical obstruction is once removed. Of these the following case is an illustration:—

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A woman, aged 20, with a somewhat obscure suppurative condition on the right side of the chest, gave a history that five months previously she had choked on a fragment of bone. After half an hour of violent choking she had no further symptoms till a month later, when she began to feel ill and had a raised temperature. She was admitted to hospital, and creamy yellow pus was aspirated from the right lung, offensive in smell. Her temperature was irregular, rising occasionally to 104° F. She had a loose cough, and brought up a quantity of purulent sputum.

When I first saw her she was coughing up large quantities of foul pus. There was a marked collapse on the right side of the chest, with some scoliosis to the right, and there were all the indications of purulent bronchiectasis on the right side. X-ray examination showed an extensive opacity in the right side of the chest, with an irregular margin and a definite clear space of lung tissue between the opacity and the chest wall. In view of the history of the woman's condition, and of the X-ray appearance, I considered that this was probably a case of mechanical obstruction of a bronchus by some foreign body, and therefore decided to attempt to reach this by bronchoscopy. The operation was difficult because of the quantity of pus which was continuously coughed into the bronchoscope, but as this was gradually removed it could be seen that the wall of the right bronchial tract was intensely inflamed, the wall appearing like dark red velvet. About 3 in. beyond the bifurcation of the bronchi a large cavity was entered containing thick pus, the bottom of which was formed by red granulation tissue, and was reached at a distance of 14 in. from the teeth. In this granulation tissue a minute white spot could be seen, and on gradually clearing away débris it became a white ridge across the tube, which a probe revealed to be a hard, rough structure. On its being seized with alligator forceps it proved to be some object larger than the tube, through which it could not be drawn. The whole instrument was therefore withdrawn, with the forceps holding what was evidently a foreign body. It proved to be a piece of mutton bone of irregular formation, about half an inch across. The immediate improvement in the patient's condition was remarkable; though her chest had not entirely cleared and she still coughed up a little pus, she considered herself too well for any further operation. In the next few months the improvement in her condition continued. She put on weight, and she now regards herself as being well.

The treatment of suppurative bronchiectasis by drainage involves very considerable difficulties. It is, in the first place, essential to secure adhesions between the lung and the chest wall, for unless the pleural cavity can be aspirated it is obvious that any attempt to drain across it will only complicate matters by producing empyema. It will be found that in most cases the most effective plan is to make a full surgical exploration of the chest. An extensive incision is made at the seventh intercostal space. The ribs are spread, and the lung directly examined.

A bronchiectatic lung will be noticed to be dark in colour, and rigid from infiltration, and where anaesthesia is being carried out by the intratracheal method, the bronchiectatic lung fails to shrink when the pressure is reduced. If there are no adhesions a section of rib over the bronchiectatic lobe should be resected, and gauze packed in so as to ensure the formation of adhesions between this portion of the lung and the chest wall, the skin incision being entirely closed. At the end of a week the gauze is removed, and a fortnight later the actual drainage of the lung may be undertaken, since by this time solid adhesions will have formed.

In some cases the drainage of the lung is quite simple, the destruction of its tissue having resulted in the formation of a definite abscess cavity, but in other cases the problem is more that of emptying a septic sponge than of draining a cavity. Here the method of Evarts Graham may sometimes be used with remarkable success, a large cavity being burnt out of the lung by means of a soldering iron at a low temperature. If this is done with sufficient boldness a large cavity will be left, into which open numbers of dilated bronchi. Not only can pus drain away from these bronchi with absolute freedom, but air can enter them through the opening in the chest wall. Personally, I regard this aeration as one of the most important factors in combating infection, since most of these cavities are swarming with

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anaerobes. It might be imagined that difficulty would arise in getting a fistula to close which communicated directly with the bronchi. My own experience is that if the opening is only large enough, granulation from the bottom is quite rapid, and the wound closes with absolute security. This is in marked contrast to the extremely unsatisfactory results of simple drainage through a small tube.

The following case is one of the best examples I have seen of this method of treatment:—

A woman, aged 31, dated her illness two years previously from an attack of pneumonia which had never quite cleared up. Nine months after this attack she had a slight hæmoptysis and was admitted to Brompton Hospital. No tubercle bacilli were found in her sputum, but she was sent to a sanatorium where she remained in bed for four months. For a time she was better, but for the last six months she had had a troublesome cough, severe dyspnoea, and an evening temperature running up to 102° F. She was a thin, wasted woman, and said that she had lost 2 st. in weight during the last six months. There was marked clubbing of the fingers. Over the right base there was marked dullness with diminished vocal resonance and absent breath sounds, whilst an X-ray photograph showed a dense shadow in this region, suggestive of empyema. She constantly coughed up large quantities of foul pus, often blood-stained, and her temperature oscillated between 97° and 103° F.

A needle withdrew streptococcal pus, and an exploration of the chest was therefore carried out. The pleural cavity was found empty and clear of adhesions, except at the point where the needle had been inserted. The right lower lobe gave the impression of being almost solid at its lower pole, which was dark purple in colour. Gauze was packed in between the lung and the chest wall with a view to obtaining adhesions round this area; it was withdrawn a week later.

A week later bronchoscopy showed that the right bronchus and the branch leading to the lower lobe were intensely engorged, resembling red velvet, and a cavity of some size was entered; it contained pus. An attempt was made to wash this out, and was repeated on several occasions, but without much success. The trachea was so irritable that bronchoscopy without an anæsthetic led at once to violent coughing and the evacuation of the abscess up the tube. As emptying the abscess had no effect on the temperature, it was determined to drain the cavity through the chest wall. A large opening was therefore made over the adherent area, and through this a large cavity in the lung was entered. The opening was enlarged with a heavy copper cautery at a low heat, and by this means the outer wall of a cavity, about 3 in. in diameter, was destroyed. Into this cavity opened several bronchi as large as a finger, and pus poured from these.

Since then she has made uninterrupted progress. The wound closed at the end of two months, when she had put on a stone in weight. It has never shown any sign of breaking down, and now, two years after the operation, she is in the best of health.

Mr. V. E. NEGUS (Section of Laryngology).**BRONCHOSCOPY.**

My experience of the treatment of pulmonary suppuration is confined to the use of the bronchoscope, and has been gained in the last eighteen months, during which time I have performed rather more than one hundred bronchoscopies on seventeen patients with chronic infection of the lungs.

Apart from the direct benefit of this procedure to the patient there is the added advantage of constant practice and the development of team work, both of which are of the greatest utility when the laryngologist is called to remove a foreign body from the lung, an operation of infrequent occurrence.

In fact, in the period during which these hundred examinations have been made only one case of foreign body has had to be dealt with.

Technique.

Any idea that in this country bronchoscopic treatment is difficult to carry out under local anæsthesia—as advocated by Chevalier Jackson—is a fallacy. Attention must be paid to detail, a team must co-operate with enthusiasm, and the teaching of

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the Philadelphia clinic must be followed with precision. The chief assistant is the house surgeon, who is changed every six months, and the other assistants are the theatre sister and nurses, who become adept in a very short time. Under these conditions it is easy to do all that is necessary in a case of lung suppuration within three or four minutes, merely having made a local application of cocaine to the larynx, and a preliminary injection of atropine. The latter is useful but morphine is unnecessary and is not desired by the patient.

In nervous persons and in children general anaesthesia can be used with safety if desired; in the case of my patients about eighty bronchoscopies have been carried out with local, and twenty-five with general anaesthetics.

(1) Foreign Bodies.

Of the causes producing chronic infection of the lungs, the first in point of interest but not in frequency is a foreign body.

One is always on the look out for patients with unsuspected objects in their lungs, but fortunately they are rare to find. In their treatment the help of frequent practice and the co-operation of experienced assistants would be inestimable, because of the difficulty of removing an object embedded in a mass of granulations, obscured by the products of suppuration of the lung. Such a case would, however, well repay years of weekly practice because of the certainty of immediate cure.

(2) Neoplasms.

Next among causes producing lung suppuration are placed neoplasms arising in or extending into a bronchus. Malignant growths can be directly observed and a piece can be removed for microscopic examination without undue difficulty, and in suitable cases local applications of radium can be made use of.

An example of a rare cause of chronic infection of the lungs has recently come under my experience, in a patient referred to me by Sir StClair Thomson and Dr. Trail, of King Edward VII Sanatorium, Midhurst. The patient was a lady, aged 24, who had recurrent hæmoptyses and purulent infection of her left lung. Lipiodol was injected by Dr. Burrell, and an X-ray taken by Dr. Melville showed obstruction at the top of the left lower lobe bronchus. The blockage turned out to be caused by a fibroma, which was removed through a 7 mm. bronchoscope with subsequent cure.

(3) Bronchiectasis.

In the third group are patients who comprise the majority of those dealt with, namely those with cavities in the lungs communicating with a bronchus. These cavities may be the result of an abscess which has burst into a bronchus or else are formed by dilatation of one or more of the air passages, subsequent to pneumonia or chronic bronchitis. The ætiology may be put on one side as the present object is to suggest treatment of the established bronchiectasis.

A digression is necessary in order to refer to the physiological and pathological conditions which prevent improvement in the untreated patient.

Chevalier Jackson has described the normal respiratory movements of the bronchi, namely, lengthening and expansion on inspiration, and shortening and contraction on expiration. Many others have made observations on the same subject, but a point rather neglected is that of the mechanism of these movements. Without entering into a lengthy discussion of the subject it is sufficient to state that for various reasons it appears to me that the diminution in the lumen of the bronchi and bronchioles at expiration is due to active contraction of the bronchial and bronchiolar musculature, and that expansion at inspiration is associated with relaxation of the circular unstriated muscle fibres. When the individual coughs the degree of contraction is much greater than during normal expiration and the smaller air tubes are

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almost obliterated; this again appears to me to be the result of active muscular contraction.

If secretion is contained in normal air tubes the expiratory movement, combined with ciliary action, tends to expel it, particularly during cough, but if active inflammatory processes are at work the mechanism is upset. For in the bronchi leading from a bronchiectatic cavity of long standing there is found to be inflammatory thickening and in many cases granulation tissue as well, both of which cause diminution in the calibre of the air tube.

When a patient with such a condition gives a cough the lumen of the bronchus leading from the cavity is completely occluded, instead of merely diminishing in calibre. Instead of helping to squeeze out secretion, the closed bronchus offers a powerful barrier to the exit of pus, and contraction of the chest wall merely compresses the cavity, and may even force secretion and air backwards, and thus produce other bronchiectases. If the inflammatory swelling and granulations be very marked, it is impossible for pus to escape from the bronchiectasis even when the patient carries out postural treatment, unless the pressure of the retained secretion reaches a height sufficient to force its way through the obstructed outlet.

The reason why bronchoscopic treatment does good appears to depend on several factors. First, the aspirating bronchoscope is inserted down to the mouth of the smaller bronchi and holds the air passages open when the patient coughs. Therefore it is possible for pus to be expelled freely. Secondly, a thin, straight suction tube can be passed down the finer bronchi almost to the limits of the lung in the lower lobe, or a specially long flexible aspirating tube of the Lynah type can be inserted into the upper lobe bronchi, and any cavity can be emptied of its residual pus. It is this stagnant collection which causes fœtor, and its constant oozing into the adjacent bronchus produces swelling and the formation of granulations. Thirdly, permanent dilatation is carried out by the bronchoscope, by the aspirating tube, or by dilating forceps. And lastly, granulations can be painted with 10 per cent. silver nitrate, which causes them to decrease and to disappear.

The stages of this process are illustrated by the case of one patient with a large bronchiectasis in the right lower lobe; he was at first unable to empty the cavity by himself, although it could be pumped dry through a bronchoscope, but after fifteen aspirations he can get rid of all retained pus by postural coughing.

All my patients undergo regular posture treatment and also inhalations on a Burney Yeo mask, together with creosote or guaiacol in gelatine capsules.

I have tried injections of gomenol, and lately, at Mr. Jenkins' suggestion, iodoform emulsion. There does not seem to be any advantage in these measures, and I have at present discarded them.

The washing out of cavities with antiseptic lotions in my cases has appeared to do more harm than good, and the best results I have secured have been by means of the purely mechanical measures referred to, namely aspiration, swabbing, dilatation of narrowed tubes and removal of granulation tissue by silver nitrate.

A bronchiectasis resembles a lake with an obstructed outlet and with tributaries draining into it from a swampy area. Disinfectants do not reach the pus-producing swampy region of infected lung, but re-opening of the main outlet empties the lake and by allowing the tributaries to discharge themselves, gives the pus-drowned bronchioles and lung tissue a chance to dry up and recover.

The most successful cases are those with only one or two cavities, while those with multiple bronchiectases or with diffuse suppurative bronchitis do not respond at all well. Almost every patient, however, can be improved to a marked degree; weight is gained, sputum is diminished, fœtor is lessened or eliminated, fever

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disappears, clubbing of fingers is lost, and life becomes safe and tolerable, even though cure cannot be guaranteed.

Before embarking on more extensive surgical procedure, it would seem only fair to give the patient a trial of bronchoscopic treatment; no harm is done even if improvement does not follow. Patients come from their homes for bronchoscopy and return none the worse after four or five minutes of discomfort followed by a meal and a short rest; hospital beds are not taken up, time is not wasted, and there are no dangers or unpleasant after-effects. Once a patient has discovered the benefit of bronchoscopy it is an actual disappointment to him if he does not receive treatment, and instead of needing persuasion, it is at his own wish that a tube is inserted at regular intervals.

Dangers of Bronchoscopy.

The only undesirable occurrences I have met with have been on two occasions. The first was only indirectly connected with bronchoscopic treatment.

A patient with very extensive involvement of the right lung had an injection of lipiodol by the usual method through the crico-thyroid membrane. Cellulitis of the neck commenced at the site of the puncture, and led to mediastinitis, followed by death.

In the second case, a swab came off its carrier in a bronchiectasis, and could not be seen at the time. It was, however, recovered two days later with no after-effects.

DR. GEOFFREY MARSHALL.

I agree with Dr. Burrell as to the treatment of bronchiectasis, especially as regards the good results often obtained by medical treatment in cases of moderate severity. There are a few cases in which severe bronchiectasis is limited to a portion of one lung, and for these I would ask the surgeon's assistance. Cases of pulmonary abscess should all be dealt with surgically. Some of them benefited remarkably by the induction of an artificial pneumothorax, as in the case of a patient whom I showed at a clinical meeting here some five years ago. After two and a half years he died of hæmoptysis, and I believe that the more permanent collapse brought about by surgical means is the safer form of treatment, as Mr. Roberts has pointed out.

Cases of localized bronchiectasis and of pulmonary abscess form a small proportion of the cases of chronic non-tuberculous lung disease that come for advice, and the rôle of the surgeon in this field is therefore a very limited one. I should like to say, with a view to giving as little offence as possible, that the surgeon is responsible for the production of far more chronic lung infection than he can ever hope to control by treatment; the responsibility lies with the surgeon and his anæsthetist. Many a case of bronchiectasis can be traced to the inhalation of material during the course of a general anæsthetic, and this danger is always present if the head of an anæsthetized patient is not kept below the level of the shoulders; in operations about the mouth, nose and throat, the danger is most obvious.

Another point I would raise is the surgical treatment of pleural empyema. I see many cases every year in which chronic infection of the bronchial tree results from immobility of a lung after operation for empyema. The immediate results of rib resection and drainage by tube are admirable, the later results are often profoundly unsatisfactory. If an open tube be left in the chest wall for any length of time, the lung collapses, pus and organisms become distributed all over the pleural cavity, the pleura tends to become thick and fibrous, and, forming a dense coating on the collapsed lung, effectually prevents its subsequent re-expansion. In a large proportion of the cases the tube should be removed after forty-eight hours, and in all cases the tube should be sealed by means of a water-valve.

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Dr. Chandler has kindly left to me for discussion that large group of cases which come under the heading of chronic bronchitis. Many of these patients are by constitution emphysematous. Because the chest wall is immobile, secretions stagnate in the lungs, and the stagnant secretions may become the breeding ground of organisms from any chance infection. Oral sepsis is a common source, and it may be unnecessary to look further. If chronic bronchitis occurs in a patient whose lungs are normally expansile, there is in all probability a grossly septic focus from which organisms are invading the bronchial tree. In these cases it is my practice to ask a laryngologist to search for the septic focus.

A case in point was that of a man of 57, sent to me last year by Dr. Broadbent, of Ilford. He had had cough and expectoration for ten years, and recently attacks of asthma at night. His chest expansion was $3\frac{1}{2}$ in., there were moist sounds in the lower lobes. Although the throat and nose appeared to me healthy, I asked Mr. Mollison to look for sepsis, and he found pus in the left frontal sinus. This was drained and the symptoms were completely relieved; there was no recurrence even after exposure to a London fog. In this case the signs of bronchitis had been in the lower lobes.

There is a smaller group of cases in which bronchitis is found to affect chiefly the upper lobes. My experience is that these latter cases are all due to sepsis in the throat, nose or sinuses.

An example was the case of a man, aged 47, who had had cough and expectoration, sometimes tinged with blood, for two years. There were signs of bronchitis in the upper lobes. I referred him to Mr. Mollison who found pus in both maxillary antra. After radical drainage of these sinuses his pulmonary condition cleared up completely.

In 1922 a colleague asked me to come and see his wife at once; he had just examined her chest and found that she was suffering from "advanced pulmonary tuberculosis." She had coarse râles over a large area at the apex of one lung, but resonance was normal. The sputum contained no tubercle bacilli and did not infect a guinea-pig. She had suffered from ozæna for years. Mr. Somerville Hastings found pus in a maxillary antrum and drained it. When residual sepsis had been cleared up in the sinus, symptoms and pulmonary signs disappeared.

A similar case was that of a young butcher whom I saw in 1923. He had had a mixed hæmoptysis six years before, and abnormal signs had been found at the apex of the right lung. In consequence he had undergone four years' treatment at sanatoria as a case of tuberculosis. The sputum had been examined on numerous occasions for tubercle bacillus without success. I sent him to Mr. T. B. Layton who found nasal obstruction. This was relieved by operation. Cough, expectoration and dyspnoea ceased, the abnormal signs in the lungs became much diminished.

Krönig (*Deutsche Klinik*, 1907, xi, p. 634) described cases simulating pulmonary tuberculosis, under the heading "Collapse-induration of the Apex," and pointed out their relation to nasal obstruction.

The importance of sinus disease in relation to pulmonary infection does not seem to be adequately realized. In the numerous books dealing with the subject of nasal sinuses in our library there are paragraphs referring to the remote effects of sinus infection. The authors mention psychic disturbances and effects so remote as those connected with sexual function, but references to the lungs are omitted.

Dr. HUGH THURSFIELD (President of the Section of Medicine)

said he had learned that evening a great deal about his own errors of omission. He had been told by a surgeon that he did not give him the cases of bronchiectasis early enough, and the laryngologists had said much the same. One speaker declared he was dependent for his cases on the generosity of the physician. He (the speaker) thought the answer of the physician would be that for years he had implored aid in the majority of these cases from both his colleagues, and that until within the last four years both the surgeons and the laryngologists had

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declared they could do nothing for them. That position was now changing rapidly, and it was clear to him from the evening's discussion that a very great advance had taken place, and was still progressing, among surgeons and laryngologists, with their modern equipment, bronchoscopes, etc., and with the aid of suction and lipiodol, so that now the condition could be more accurately diagnosed, and offered new possibilities of treatment. If the further development of washing out the dilated bronchi should prove as good as it seemed to promise in many cases, particularly in those recorded by Mr. Martin, then he thought physicians would be able to receive that aid which hitherto had been requested in vain.

It was not, he thought, altogether a question of not getting the cases early enough, because in many instances one could see a very serious condition developing in quite a short time, not months, not even weeks, but in a few days. It was in these cases that so much good seemed likely to accrue from bronchoscopy and lavage.

Dr. E. STOLKIND

said that for the diagnosis and treatment of pulmonary diseases bronchoscopy should be used as frequently as possible and should really be made a routine practice. In 1912 [1] and in 1914 [2] he (Dr. Stolkind) had advocated its use.

He had recorded an instructive case of a child, aged 5 years, who had had during her last six and a half months of life repeated attacks of pneumonia of the left lung and later clinical signs of putrid bronchitis (or gangrene of the lung) with foul sputum, etc. The child and her parents denied the possibility of a foreign body having been swallowed. X-ray films, which had been made at intervals, did not reveal any signs of a foreign body. Bronchoscopy was not performed for the diagnosis. Resection of the ribs and piecemeal removal of bronchiectatic areas were carried out by means of cauterization, which can be performed by the physician. The child died. Post mortem, putrid bronchitis with bronchiectasis, pneumonia infiltrations and empyema was found. In addition, in the left bronchus near the bifurcation, nearly half of a horn ring as large as a two shilling piece was observed. This foreign body could easily have been removed had bronchoscopy, which had previously yielded good results, been applied for diagnosis. Preceding that occurrence, he (Dr. Stolkind) had seen a case in which a fistula between the trachea and oesophagus was diagnosed and successfully treated by bronchoscopy.

This method was valuable for the early diagnosis of cancer of the lung.

He (Dr. Stolkind) said that cauterization was really a very old method of treatment of diseases of the lungs. Hippocrates advised cauterization for opening of the pleural cavity. Lenhartz, a physician (eighty-five cases of gangrene of the lungs, eleven cases of bronchiectasis, etc., between 1897 and 1907), Koerte, L. Brauer, Glueck, Kissling and many others had employed cauterization long before Graham. During cauterization an aerial embolus might occur, as he (Dr. Stolkind) had observed in a case of gangrene of the lung, in which, however, recovery took place after several hours.

He agreed with Dr. F. G. Chandler in regard to the treatment of chronic pneumonia by artificial pneumothorax; he had mentioned it in one of his papers in 1911 [3].

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Mr. TUDOR EDWARDS (in reply)

said that Dr. Chandler mentioned the long continuance of pneumothorax in fibrotic cases. Whenever artificial pneumothorax was allowed to lapse, there was a liability to a recrudescence of the symptoms, such as dilatation of a bronchus, and it was in that type of case that he (the speaker) urged the performance of phrenic avulsion, as it produced a permanent condition.

Mr. Souttar had referred to the opening of the chest, and had stated that the lung did not collapse. It was characteristic of bronchiectasis that when thoracoplasty was performed collapse of the lung took place slowly; one did not find that the involved lobe collapsed straight away. Not until three months had elapsed did one know how much collapse in the lobe would take place. He was struck with the results Mr. Souttar had obtained with the cautery—but he did not think it was a case of true bronchiectasis, but a bronchiectatic abscess, quite a different condition. The ideal treatment was to remove the superficial part with the cautery.

He had been interested in seeing Mr. Negus's pictures of the bronchi, and the spasm which occurred, as that definitely accounted for a condition he had noticed, namely, that there was no adequate drainage of pulmonary abscess because of the œdema present and the granulation tissue formation. Phrenectomy associated with aspiration might cure a certain number of cases of bronchiectatic abscess or bronchiectasis, in which either of those measures alone would not be satisfactory.

Dr. Marshall brought into the discussion the question of empyema and rather "crabbed" the surgical treatment of empyema. He agreed with Dr. Marshall that it was necessary to maintain air-tight drainage of the chest; therefore he had had a tube made with a flange, which ensured air-tight drainage immediately after opening an empyema. Measurement showed that in such a way a negative pressure of 22 mm. of mercury was maintained during the whole time, and respiratory exercises were associated. This drainage was of some value in rapidly closing the larger empyema cavities.

Mr. G. EWART MARTIN (in reply)

said he did not agree with Dr. Chandler that lipiodol could not be injected into a lung abscess cavity. Injection could be easily carried out through a bronchoscope. He hoped that shortly there might be a further communication from Chevalier Jackson's bronchoscopic clinic on the use of lipiodol.

When the lipiodol was injected through the cricothyroid membrane into the larynx or inhaled in the act of swallowing with the larynx cocaineized, it reached the bronchi, but was uncontrolled, and though the resultant X-ray picture showed an excellent picture of branching bronchi it was entirely misleading. The lipiodol was broken up into globules by the air draught in the trachea and wherever these globules adhered the appearance of a cavity was presented. If a scratch was made on the lining of the small bronchus the lipiodol would adhere there and show up as a grape-like cavity.

Correct localization could only be obtained when the lipiodol or bismuth was injected directly into the lung involved through a bronchoscope under direct vision or through a long intratracheal catheter passed down to the tracheal bifurcation.

Section of Electro-Therapeutics and Section of Surgery.

Chairman—Dr. G. B. BATTEN, President of the Section of Electro-Therapeutics.

DISCUSSION ON DIATHERMY.

Dr. E. P. CUMBERBATCH.

SURGICAL DIATHERMY: METHODS OF EMPLOYING HIGH-FREQUENCY CURRENTS IN SURGERY.

I PROPOSE to confine my remarks mainly to the technical aspect of surgical diathermy and to the methods of performing the operation. It is now known that the temperature of tissues can be raised by passing through them a current of considerable intensity; it must be deprived of its power to stimulate muscles and nerves and must not produce chemical (electrolytic) changes in the tissues. This is done by making it alternate with high frequency.

If the current is provided with a broad path in the body the temperature attained will not be high enough to harm the tissues. On the other hand, if its lines of flow are concentrated within a narrow path the temperature, being higher, will deprive the tissues of their vitality. The current can therefore be used in surgery for the destruction of abnormal tissue.

European surgeons use the term "surgical diathermy" to signify the use of the diathermy current for the purpose of heating abnormal tissue to a temperature that causes it to coagulate *en masse*. There are, however, other ways of employing the diathermy current for surgical purposes. I believe that I am correct in saying that one of these, and probably two, have not yet been employed in this country. I shall make some observations first on the use of the current for coagulating the abnormal tissue, and afterwards I shall mention other methods of employing diathermy currents in surgery.

The Operation of Diathermic Coagulation.—The current is directed through the abnormal tissue and increased to an intensity sufficient to coagulate it by reason of the high temperature attained. To secure the necessarily high concentration of current an electrode of small area is placed on the tissue to be destroyed, and the circuit is completed by an indifferent electrode of large area, placed on another part of the body. As an active electrode a small metal disc is generally used. As the current is gradually increased coagulation of the tissue commences under the edge of the disc, spreading to the centre of the disc beyond its edge, and to an increasing depth. The tissue fluids begin to boil and eventually sparks pass from the edge of the disc over the coagulated tissue to the uncoagulated part beyond. The reason for the appearance of the sparks is the drying of the coagulated tissue immediately under the disc. The dried tissue constitutes an insulator and the current is now compelled to pass in the form of sparks from the disc to better conducting parts beyond. There is no object in continuing the current after the appearance of sparks because coagulation will not now proceed to a greater depth below the surface except with extreme slowness.

In this operation the highest temperature produced is on the surface; it lessens as the distance below the surface is increased, until a depth is reached at which no destruction takes place.

Cumberbatch: *Discussion on Diathermy*

The destroyed mass may be divided into four layers, according to the effects of the different degrees of heat. In the first, or superficial, layer the tissue has not only been coagulated but *dried*. It constitutes the insulator referred to above. In the next layer the tissue cells, the walls of the vessels and their contents have been coagulated but not dried; in the third layer the blood has escaped coagulation, although the vessel walls and non-moving tissues have been destroyed. There probably exists a fourth layer in which the temperature is insufficient to *coagulate*, but high enough to kill the cells by depriving them of water. (I shall refer to this again when speaking of the method of destroying tissue by "desiccation"—a method introduced by W. L. Clark.)

The difficulty attending the application of diathermy by means of the disc electrode is that the operator cannot see how deeply the coagulation has extended. The depth is determined by various factors such as the size of the disc, the degree of moisture of the tissue, the quantity of blood passing through it, and the rate at which the current is increased while coagulation is proceeding. Experiments on *excised* tissue with discs no larger than 10 mm. in diameter, and in which the current is increased from zero to maximum at a relatively slow rate (10 to 15 seconds being occupied in the process), show that the depth of the coagulation is equal approximately to the diameter of the disc. In *living* tissues the circulation removes some of the heat generated by the current and prevents the spread of the coagulation. But it must be remembered that destruction of tissue proceeds to a greater depth than that to which visible coagulation extends. The diameter of the electrode is an approximate guide to the depth of the destruction, but this guide is not sure enough to remove risk of damage to important structures when the latter lie in close proximity to the judged depth of coagulation.

There is one method of ascertaining the depth of coagulation, namely, by curetting away the destroyed tissue, but this is not a wise procedure, as bleeding is certain to occur, even if the operator does not curette as far as the lowermost limit of coagulation, for there is a layer in which the fixed tissues, but not the moving fluids, are coagulated. Bleeding obscures the field of operation, and is difficult to stop because the heat generated by the current lessens the viscosity of the blood, accelerates its flow and increases its supply. But there is a more serious risk when malignant tissue is being treated, for if bleeding occurs and the cells have not been destroyed, there is the likelihood of metastasis being produced.

If a single needle is used as the active electrode instead of a disc the depth of coagulation is much more within the control of the operator. When it is inserted, coagulation, commencing at the *point* of the needle, proceeds quickly up the shaft to the surface. Before sufficient time has elapsed for coagulation to extend more than 2 or 3 mm. below the point, the tissue in this situation becomes dried and is rendered non-conducting, and the same process occurs around the shaft of the needle. The depth of coagulation is therefore determined by the length of insertion of the needle, whether the tissue is dry or moist and whether its blood-supply is abundant or sparse. Even if the current is suddenly started at its full intensity or is increased slowly from zero there is but a trivial difference in the extent of coagulation around the needle, the coagulated mass having the form of a narrow cylinder. By inserting the needle successively in closely adjacent sites and allowing the current to coagulate the tissue around it a wider mass of tissue can thus be destroyed. When multiple needle electrodes are used the operator cannot be so sure of the depth to which he is destroying tissue, as with these electrodes the area of contact of tissue and metal is larger; the current density is lower and a longer time is occupied in forming the insulating sheath around the needles. In this extra time the coagulation proceeds to a greater depth below the tips of the needles, which cannot be judged accurately.

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The Operation of Circumvallation.—By this means a malignant growth can be surrounded by a "rampart" of coagulated tissue. The single needle electrode is inserted into the healthy tissue adjoining a growth to a point below the latter (the direction of insertion being oblique) and the tissue coagulated around it. By repeating the process in adjacent parts in succession, the needle being directed to the same point below the growth at each insertion, the rampart of coagulated tissue will have the shape of a hollow cone, and the growth will be imprisoned within it. The growth may now be subjected to diathermy with little risk of producing metastasis. I saw this operation performed by Howard Kelly, at his clinic at Baltimore. He introduced the term "circumvallation," and as far as I could ascertain the method is widely practised by American surgeons, preceding the destruction or removal of malignant growths. The disc electrode seems to have been discarded.

The Operation of Incision and Excision by the Blade Electrode.—There are two ways of cutting and excising tissue by means of the blade electrode and the diathermy current. For the present I shall refer to the first as the *old* method, and to the second as the *new* method. They differ so distinctively that the words "cut" and "excise" are scarcely applicable to the new method. Under the old method the blade is inserted into the healthy tissue adjoining the growth and the tissue coagulated around it. It is then moved forwards, but with sufficient slowness to allow the coagulation to proceed in advance of the cutting edge. The blade must cut only coagulated tissue, and this is a very difficult operation, for it is easy to cut uncoagulated tissue or unsealed vessels, especially in the region of the point of the blade. Bleeding, therefore, is likely to occur with all its attendant disadvantages and risks.

By the new method the machine is set in operation and adjusted to give a strong current *before the blade is brought into contact with the tissue*. Contact is then made and the blade drawn into and across the tissue with the same celerity as in the use of a scalpel in a simple cutting operation. The tissue appears to divide as the blade is drawn across it, and a white line of coagulation follows the electrode, extending for a short distance into the divided surfaces. The division is not due to the sharp edge of the blade, for just before the point of the blade touches the tissue an arc-like spark bridges the gap, and as the blade enters the tissue it does not make absolute contact but is separated by a thin film of incandescent air which divides the tissue as the blade is advanced and at the same time coagulates the divided surfaces to a certain depth on each side. The facility with which the tissues can be divided and the depth of coagulation of the divided surfaces vary with different diathermy machines. Those which are constructed so as to give their maximum current at a relatively *high* voltage are less suitable. The currents from these machines coagulate deeply but do not divide easily. When the voltage is relatively low (and the current strong) the tissue can be divided with great ease but the depth of coagulation is slight. Mr. John Anderson, surgeon to the Royal Infirmary, Dundee, tells me that he has found the portable direct-current diathermy machine the most suitable when using the blade electrode for operation on the living subject. This machine delivers its currents at a low voltage.

Thus the operator can use the diathermy current in different ways or in different combinations of ways. When dealing with accessible malignant tissue the best procedure—provided a growth is freely movable and surrounded by a fair margin of healthy tissue—is a preliminary circumvallation, followed by removal of the malignant mass by the blade electrode. The division should be just within the coagulated rampart and performed by the new method. When the malignant mass is widespread and complete circumvallation is impossible the best procedure is to coagulate it as extensively as possible by means of the disc electrode and let the

destroyed tissue separate spontaneously. Healing is rapid after diathermy, even if the malignant tissue has not been completely destroyed, and if recrudescence occurs it can be treated in a similar way.

The Operation of Fulguration.—Here the tissue is destroyed by heat derived from sparks; the points on which they fall are heated to an increasing degree as they continue to pass. The tissue is dried and it may even be carbonized on the surface. The depth to which destruction can be carried by fulguration is not great. When the sparks are derived from a diathermy machine it is limited by the length of the spark. Fulguration is suitable for the destruction of papillomata of the skin and mucous membrane. Telangiectases and some forms of angioma can be removed with great nicety by the sparks. It is an efficient method of destroying lupus nodules, but this treatment alone is not always successful in removing them permanently.

Fulguration is used in America for hæmorrhoids and enlarged tonsils. By the courtesy of Dr. Bierman, of New York, I was allowed to see the operation performed on one of his private patients. He first injected a dilute solution of novocain into the sphincter, which was then dilated and the hæmorrhoids brought into view. The patient was earthed and sparks from an Oudin resonator were directed on to the hæmorrhoids. The latter gradually shrunk and were reduced to small dry masses. The patient felt nothing apart from the pain accompanying the insertion of the syringe needle.

Operations of this kind for the treatment of hæmorrhoids seem to be common in the United States. The patients stay in bed for two or three days only and are then able to resume their occupations.

In the treatment of enlarged tonsils (of adults) by fulguration, surface anæsthesia is produced and the sparks are applied by special directors, which prevent their passage on to parts other than the tonsil. The operation is repeated at intervals of two or three weeks until the tonsils have been completely removed.

The Operation of Electro-Desiccation.—This was introduced by W. L. Clark, of Philadelphia. A current of relatively low amperage is passed through the tissue by a needle electrode. That is insufficient to coagulate the tissue, but the passage of the current deprives the tissue of its fluids: in other words, it dehydrates or "mummifies" it. It has been shown by W. L. Clark that the histological picture of tissue treated in this way differs entirely from that seen when the tissue is coagulated. The dehydrated cells are shrunken, but still show the cell walls. The nuclei are elongated. In the coagulated tissue no cells are visible and a structureless mass is seen.

This treatment can be accurately localized, and is within complete control of the operator. Successful results have been claimed for it in the treatment of corneal ulcers, papillomata of the vocal cords, chalazion, enlarged tonsils, superficial malignant growths, lupus nodules, leukoplakia, and other maladies. It is said that the inflammatory reaction after this treatment is very slight and the cosmetic results excellent.

The Cutting-current of Wyeth.—The latest advance in the use of high-frequency currents in surgery has been made by G. A. Wyeth, a New York surgeon. The current is used for the purpose of cutting and at the same time coagulating the cut surfaces. The method differs from those already described in the following important particular. The coagulation does not extend more deeply than one-tenth of a millimetre, and if the electrode is allowed to remain stationary, while the current is passing, the coagulation does not continue to spread around it. Dissection can therefore be performed. In the other methods the coagulation extends to a greater depth than one-tenth of a millimetre when the blade advances, and if the latter is stopped the coagulation continues to spread to an increasing distance around it.

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The apparatus employed by Dr. Wyeth provides a high-frequency current of *sustained* oscillation and its rate of alternation is exceedingly high, viz., five million per second. The active electrode is a thin needle or a very narrow blade.

When the tissues are divided there is no bleeding from the capillaries. These vessels are sealed; so also are the small lymph channels. Blood, however, escapes from the divided arterioles and larger vessels. The cut ends must be seized by pressure forceps. If now the needle or blade electrode is brought into contact with the forceps and connected to a source of diathermy current, the cut ends held by the forceps are coagulated and sealed. The forceps can then be removed. The machine employed by Dr. Wyeth provides both currents, one which effects the division of the tissue and coagulation of the divided surfaces; the other is the ordinary diathermy current which can coagulate tissue *en masse*. By turning a switch either current can be directed to the electrode. The cutting current, strictly speaking, is not a diathermy current. If it is directed through the tissue by way of a needle, which is inserted into the latter, *before* the machine is set in operation, the tissue around the needle does not coagulate.

Healing by first intention will take place after tissue has been divided in the manner just described, if the divided surfaces are brought together. It might be thought that the inclusion of destroyed protein in the wound would cause post-operative shock, but Dr. Wyeth tells me that this is not the case. He told me much that was interesting about his investigation and kindly showed me the operation in his consulting rooms in New York in November last year. On a visit to Dr. Howard Kelly's clinic at Baltimore in October, 1925, I learnt the high opinion which Dr. Kelly had formed of Wyeth's method. Dr. Kelly and Dr. Grant Ward demonstrated the operation on excised tissue. Both surgeons employ the method in major surgical operations, such as the radical amputation of the breast.

In a paper entitled "Endothermy, the New Surgery," Dr. Howard Kelly writes:—

"In the old-fashioned bloody surgical operations, commonly in vogue, I now begin to think with some repulsion of the messiness of the procedure, the sponging, the tying, the needling, and the general manipulation of the wound, which must contribute to so many bad results. I therefore welcome this new method of coagulation as a new addition to our technique, not only enabling us to do some things better, but greatly enlarging our field of beneficent activity. I give the Wyeth sector the leading place and decided preference in my daily work, relegating the scalpel to a subordinate position."

Dr. Kelly has named the active electrode the "acusector." Dr. Wyeth calls it the "endotherm knife."

In conclusion, I will refer to some interesting work by Mr. John Anderson on the use of diathermy in surgery. I much regret that he is unable to come to the present meeting, but he has kindly allowed me to refer to his work of the past three years. He uses a small platinum blade or a Bard-Parker knife as an active electrode, and incises and dissects the tissues by the method previously described as the *new* method. He has found that the current delivered by the small direct-current diathermy machine is most suitable.

Mr. Anderson writes:—

"I first tried the method on minor non-malignant tumours, dissecting back flaps and suturing up. I found the healing so perfect that I immediately attempted complete dissection of the breast and the axillary area by this method, and was more than satisfied with the result. Since then I have used the diathermy knife in over eighty cases of carcinoma mammae, dissecting back flaps, exactly as one does with the scalpel, and using the ordinary knife for the small area of axillary vessels and nerves. I also used it for the hæmostasis of the operation, apart from six to ten ligatures in the same area, and closed the wound in the same way—by suture and clips."

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Mr. Anderson says that the results compare very favourably with those he obtains by the knife. He finds that the method has no disadvantages, as compared with the scalpel, and has several advantages. There is less pain and less shock, and the healing is, on the whole, better than with the use of the scalpel. He thinks that the sealing off of the lymphatics, as they are dissected away, greatly lessens the chance of a recurrence.

In a second communication, Mr. Anderson tells me that in the employment of his method the hæmostasis occurs in the very small vessels, but the larger ones require the application of the forceps; their coagulation is then effected by touching the forceps with the electrode. He says that the reason why he does not use the diathermy in the axilla is the fact that electrical stimulation is conveyed to the nerve trunks and jerking of the arm takes place. He does not think it is important, surgically, to dissect the small axillary portion with the diathermy knife; because the cancer that is spread thus far is not likely to be allayed by this method.

In answer to my query as to the possibility of the production of shock after suture and the inclusion of coagulated protein in the wound, Mr. Anderson tells me that "none of the cases have shown any signs of shock, pain, or protein absorption."

MR. F. J. STEWARD.

THE SURGICAL ASPECT OF DIATHERMY.

My experience with diathermy is confined to the treatment of new growths, malignant or pre-cancerous, situated either on the surface of the body or within the mouth or pharynx. A comparison between diathermy and a cutting operation in the treatment of such cases will, I believe, establish the superiority of diathermy provided certain conditions regarding technique and the choice of case are observed.

In the first place, the final result is identical, for the mass of tissue coagulated by diathermy is in part removed at the time of operation, in part separates as a slough after operation, and in part is absorbed, so that if the coagulation is carried well beyond the limits of the growth in all directions the result is precisely the same as after excision.

Secondly, diathermy is practically a bloodless operation. The advantages of this are obvious. The operation itself is quicker, much simplified and more precise. If it concerns the mouth or fauces the danger from inspiration of blood or septic material is practically eliminated, whilst the general condition of the patient and his powers of resistance are conserved instead of being greatly drawn upon by loss of blood.

In the third place, post-operative shock is very slight and not to be compared with that resulting from a severe cutting operation. Freedom from loss of blood, and the diminution in the time taken by the operation no doubt partly explain this absence of shock, but it seems probable also that the trauma of coagulation is less shock-producing than that of cutting.

The hæmorrhage and post-operative shock associated with a cutting operation only too frequently pave the way for sepsis, which is liable to result in secondary hæmorrhage or pneumonia. It is, therefore, not surprising that as hæmorrhage and shock are absent, convalescence after diathermy is usually rapid and devoid of complications.

A fourth point is the comparative freedom from pain after diathermy operations, both immediately and throughout the process of healing. This absence of pain is in fact an inducement to carry out diathermy as a palliative measure in cases that are clearly too advanced for any hope of cure to be entertained. For instead of adding to the patient's misery to no purpose, as heroic operations in advanced cases are

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liable to do, diathermy gives immediate relief, which lasts, at any rate, for a considerable period.

Finally, the rapidity of healing and the character of the resulting cicatrix call for notice, for in spite of the production of extensive sloughs, the separation of these and the epithelialization of the resulting granulating areas take place rapidly, and the scars, especially those of the skin after destruction of rodent ulcers, are usually smooth and soft, and without tendency to hypertrophy and contraction.

As to the operation, certain requirements must be observed or failure is certain. The destruction of the growth and a considerable amount of the healthy tissues surrounding it must be very thoroughly and systematically carried out, and in order to accomplish this properly it is essential that the growth and its surroundings be fully exposed to vision in every part, so that the operator can see exactly what he is doing. This condition is of the first importance, for it is inconceivable that a growth could be completely destroyed if working round a corner, or at the bottom of a dark cavity, however ingenious the construction of the electrode.

Proper exposure can be obtained in some cases by the use of retractors, gags, sutures through the tongue, or suspension; but in others preliminary operations perhaps of some magnitude, will be necessary. These will include splitting the cheek or soft palate, division of the mandible, or pharyngotomy. A proportion of the cases do not admit of satisfactory exposure by any means, and are therefore unsuitable for diathermy.

The growth having been thus exposed, and being under good illumination, the operation is proceeded with. In order to avoid the possibility of missing any portion of the growth it is as well to mark out the limits of the area to be treated with the diathermy knife as a first step, and then to proceed to the systematic destruction of the tissue within the limiting line so formed.

If the character of the growth is such that there is a chance of cure the question of removing the lymphatic glands necessarily arises. I make this the first stage of the operation and usually ligature the external carotid after removal of the glands, then proceeding to the diathermy of the primary growth. Unfortunately the neck wound has become infected in a number of these cases. This must be due either to spread of infection from the mouth by way of the lymphatics or to accidental infection of the neck wound during the diathermy. If the former explanation is the correct one it is curious that the tissues of the neck have seldom shown signs of infection unless a gland dissection has been performed.

The selection of cases suitable for diathermy must necessarily be in the main a matter of experience and therefore one of individual opinion. Personally, I avoid diathermy when the growth involves bone, for I find that when the sequestrum resulting from the diathermy has separated, recurrence of the growth nearly always takes place in the bed in which the sequestrum lay. I have had only one satisfactory result where bone was involved—in a case of large rodent ulcer of the frontal region. After a sequestrum of considerable size had exfoliated, the cavity left healed rapidly and has remained healed for over three years.

Apart from involvement of bone the possibilities of diathermy would appear to be limited only by the question of the satisfactory exposure of the growth and the general condition of the patient.

MR. GWYNNE WILLIAMS

said he almost entirely agreed with that speaker and he would limit his remarks to carcinoma of the tongue and in the floor of the mouth. In dealing with such cases he had not used the knife for six years. Two points ought to be considered: first, whether the technique employed in diathermy was more comfortable and gave a

better immediate result than with the knife; secondly, the more difficult question as to whether the ultimate result, *qua* currents, was better than those with the knife.

So far as he could make out from the opening paper, the method he (the speaker) had been using was coagulation and cutting, and the great difficulty he encountered was to keep his cautery knife going at the correct pace, and keeping the current reasonably constant. Provided that was done one could remove portions of the tongue, floor of the mouth or cheek with only slight loss of blood. In many cases it was necessary to tie the lingual artery, and though sometimes one could manage without doing so, it was better to tie it, because in some cases in which this had not been done reactionary hæmorrhage developed when the patient returned to the ward.

With regard to the after-condition of the patient, the most striking point to him (the speaker) was the absence of pain, and the way in which the patient could, on the following day, move that portion of tongue left to him.

Concerning the question of secondary hæmorrhage, in the second case he operated upon by this method, the patient died from secondary hæmorrhage, and he attributed the death to the mouth not having been kept clean. This was, in his opinion, quite as necessary with diathermy as with operations by the knife. Cleanliness was a great factor in the recovery of the patient. He relied much on his sense of smell in judging of any lack of cleanliness. He had not had a case of secondary hæmorrhage since.

He agreed that the scar left after diathermy was much softer than after the use of the knife. Six years ago he operated with the knife on a patient for carcinoma of the floor of the mouth, and the patient had had his tongue bound down to the side of his jaw. There was what seemed like a recurrence and he (the speaker) removed this with diathermy, with the result that the tongue was much freer than previously.

His practice was to remove the glands in the neck very freely at a separate operation.

The ultimate result, as regarded recurrence, he considered to be the same, whether the operation was done with the knife or by diathermy, and this should be so unless the cause of the recurrence was implantation of carcinoma on the raw area of the tongue at the time of the operation.

Mr. DOUGLAS HARMER.

TREATMENT OF ULCERS OF THE UPPER AIR-PASSAGES BY DIATHERMY.

The first operation of surgical diathermy in England was performed by Professor Nagelschmidt, introduced by the late Dr. Lewis Jones, in the Throat Department of St. Bartholomew's Hospital. A large, pedunculated malignant tumour of the nasopharynx was burnt away with good results. The onlookers were much impressed by the simplicity of the operation, and by the fact there was no bleeding. Shortly afterwards an instrument was purchased, which has been constantly used for the destruction of different types of ulceration in the upper air-passages.

After sixteen years' experience of this method I am confident that it is better than simple excision with the knife, and I would like to see the principle accepted that malignant ulcers ought never to be removed by cutting when diathermy is available. It has been found that the mortality is practically negligible, and that shock, pain, toxæmia, and secondary hæmorrhage are rare. Only two of my cases succumbed from bleeding. The best results have been obtained from prolonged burning, which, in many cases causes wide destruction of tissues, with resulting deformity. In different regions good results can be obtained, either by needling, by buttons, or by excision. Before the latter is undertaken the ulcer should always be completely

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coagulated. When bone is involved it should be freely destroyed. Bone involvement is no contra-indication to the treatment. If recurrence occurs in the region treated it is rarely widespread in the early stages. More often small suspicious nodules are seen, or an excessive amount of scar tissues. Both of these conditions call for early treatment. In many instances radium or X-rays are needed either before or after diathermy.

It is probable that by employing diathermy in preference to simple excision for malignant ulcers in the upper air-passages the number of cures obtained has at least been doubled. In most of the failures the primary ulcers have done well, but the patients have succumbed to metastases in the glands of the neck. At present we still have no really satisfactory method of dealing with many of these conditions.

[Mr. Harmer showed lantern slides illustrating the results obtained by diathermy in different parts of the upper air-passages.]

Description of Cases.

(1) This is an endothelioma at the inner part of the orbit. I excised it freely, but in spite of removing it, with the periosteum, rapid recurrence took place. In 1911, at the instigation of Dr. Lewis Jones, I burned away the growth with a button electrode, and she (the patient) remained free from recurrence for twelve years. Tiny nodules then appeared, and they were treated with radium needles, and then she remained well until ten days ago. At that date the tissues began to be thickened again, and a week ago the growth was destroyed by diathermy. This photograph, taken to-day, shows a healing cavity, with slight trouble at the lowest part. The patient has been well since 1911.

(2) Next is a type of growth, epithelioma, which is fairly common in the region of the eyelids and orbit. Though the disease was very extensive, and though the patient had been under treatment by other methods, i.e., X-rays, radium, etc., for eighteen months, he was considered fit for treatment by diathermy. The growth was burned away on two occasions, most of it being destroyed successfully with the first treatment, and six months later some suspicious-looking nodules were removed. The sequestra separated, the eyeball was removed, and he remained well three years, with a perfectly healed and healthy wound. Death was due to pneumonia.

(3) Here is a patient who had rodent ulcer of the nose. It had been excised on several occasions at another hospital. I removed the whole of the lower part of the nose with the diathermy knife. Healing was rapid, and later a plastic operation was done. This patient remains free from recurrence for three years afterwards.

(4) Here is a boy who had been treated for five years as a case of lupus of the nose, in a provincial hospital. He had had various operations, X-rays and radium treatment, and no healing had been obtained. Sections were taken, and showed no signs of malignant disease. The Wassermann was negative. There was no evidence to prove it was tuberculosis or other known infection. As soon as he came to St. Bartholomew's Hospital the whole of this affected region was burned out thoroughly with diathermy, including the ulcer into the nasal fossa, and the ulcer on the cheek. Immediate healing was obtained. He was left for about a year, then a new nose was made for him by Mr. Gillies. I have lost the photograph, but he has remained well and perfectly healed four years.

(5) This next patient shown came with an ulcer on the tonsil, which appeared to be a typically malignant growth. It was freely removed by diathermy, sections were made, and they showed nothing but inflammatory tissue. The wound healed soundly and securely, and has remained in that state since. She disappeared for a time, and a year later she came to the hospital again with what appeared to be a malignant growth in the right cheek. Again investigations were made, as it was thought it might be some rare disease, such as actinomycosis. We were unable by examination to make a definite diagnosis of the condition. As the disease was so virulent it was decided to treat the growth with diathermy, and I show you the result, about a year later. The whole of the disease had disappeared, the tissues were entirely healthy, and a new lip was made by a plastic operation, and it remains free from any infection now.

(6) Next I show you a case which illustrates failure of diathermy. This man had an epithelioma which originated in the antrum and ethmoidal region. It had already involved

the skin, as you see. It was thoroughly burned away, and a healthy cavity obtained. The sequestra separated, and at the end of a year it seemed that the patient had been cured. He disappeared for a time, and when he came back the whole cavity was as you saw in the first picture, a mass of malignant growth, with so extensive a recurrence that no further operation was performed.

I think there is no doubt that since diathermy has been employed the number of cures that have been obtained has been almost doubled. The route I prefer for these cases is through the palate, and *this* diagram shows you the exposure you get by removing half the palate. The growth can be burned out thoroughly with diathermy, and afterwards the wound should be packed with radium, large doses being used for forty-eight hours. As a rule, good results follow from this. This method gives good exposure, and leaves a hole through which you can inspect the cavity. Lastly, if there is any recurrence it can easily be treated, and there is hardly any deformity resulting from this method.

The Mayo Clinic have just published the results of treatment of ninety-seven cases by this means. In secondary malignant growths they have obtained 50 per cent. of cures; in primary disease in the antrum, they cured about 37 per cent.

MR. H. H. RAYNER

said he would remark on his experience in the treatment by diathermy of cancer of the skin and of the breast. He was convinced of the advantages of surgical diathermy in the treatment of malignant disease generally, whether applied to oral or to skin conditions. He strongly believed that the risk of recurrence was diminished by using diathermy.

The method could be profitably used in three types of cancer of the skin. First, the extensive rodent ulcer case, in which radium had been used and had failed, or for which radium was plainly inapplicable owing to the extensive connexions of the growth. The second type was lupus epithelioma or lupus X-ray epithelioma. These cases could, in their early stages, be satisfactorily dealt with by ordinary surgery, but in the advanced stages, which these cases were often allowed to reach, diathermy would generally give a better result, both with regard to the economy of surgical interference and in the ultimate result. Lastly, there was the type of epithelioma which was foul and very heavily infected, and therefore carrying an appreciable risk of sepsis with the employment of ordinary surgery. The same risk was felt to be present in the case of epithelioma arising from the anal margin of the anal canal. One case involving the anal canal he had operated upon three years ago; the patient had been sent for a palliative colostomy in order to reduce the soiling of the growth during defæcation and to free the patient from the mechanical interference with defæcation arising from the presence of such a large mass. There was a cauliflower-like mass the size of a cricket ball, principally on the skin of the perineum, and extending into one lateral wall of the anus. He (the speaker) removed the mass *en bloc* by the diathermy knife, and opened the anal canal freely. The wound healed in three to four months without any inflammatory reaction, leaving a clean linear cicatrix. There was some contraction of the anal margin but not to a serious extent. There was no local recurrence for the remaining two years of the patient's life. He died from abdominal metastasis, and up to the date of death the linear scar was sound and free from local recurrence.

With regard to diathermy in palliative treatment of cancer of the breast, he had not tried Mr. Anderson's method, but he had used diathermy in a different way for cases which were plainly inoperable—the type in which a massive growth was fungating through the skin, or was about to ulcerate through the skin. In such a case diathermy would effect a benefit not obtainable by means of knife surgery. If there was no internal metastasis or massive enlargement of glands, such patients could live an active life for one or two years; he had one case in which the patient had survived 2½ years, and was still free from evidence of recurrence or metastasis. Much help was obtained by the application of radium to the axillary glands.

Section of Electro-Therapeutics and Section of Surgery 67*Description of Cases.*

(1) The first slide shown represented a case of rodent ulcer, which was operated upon two years ago. It had infiltrated deeply, and was attached to the mucous membrane of the mouth. The ulcer was excised *en bloc* with the diathermy knife, and the island of tissue removed represented the whole thickness of the cheek. Hence he had a large hole in the cheek, through which several teeth were visible and food was apt to escape. There resulted a large foramen lined with mucous membrane. Four weeks after the diathermy operation, under local anaesthesia the edges of the fistula were pared, and an operation to close the aperture was carried out. There was some keloid change, but it would be agreed that the result was not bad, considering the original extent of the ulcer.

(2) The next slide was from a case of lupus epithelioma of the chin and neck particularly. It had been treated immoderately by X-rays. The growth was excised with the diathermy knife and the whole floor of the operation wound was systematically diathermized with the disc electrode. This photograph showed the condition less than three weeks after the operation. He (Mr. Rayner) had taken an ordinary tube flap from the chest, and the operation failed owing to bad technique, and in the time elapsing before anything else was attempted, healing took place. The present picture showed the condition four months after operation.

(3) The next case depicted was that of a very extensive rodent ulcer, which a dermatologist had asked him to see. The right eye had been completely disorganized, and the use of the left was being threatened. Fourteen months ago he had excised as far as he could with the diathermy knife, and the secondary foci he touched with the spherical electrode. Three weeks after the operation the photograph showed an appalling wound; the whole orbit had been eviscerated. The sequestra were rapidly extracted in six weeks by picking them off with dissection forceps, and, to accelerate healing, the cheek and floor of the orbit were covered with a Thiersch graft, held in place by a dental stent. The present picture showed good healing. The operation had been done only fourteen months ago, and for that reason he had delayed the consideration of doing a rhinoplasty operation. He hoped to get the patient fitted with an artificial nose.

(4) He next showed a second photograph of a case of anal epithelioma. The growth seemed have arisen from the mucous membrane of the anal canal. The epithelioma had been excised by another surgeon four months before, and at once there followed a recurrence, before healing took place, and the edges then parted further, forming a malignant epitheliomatous ulcer. A third surgeon recommended that radium be tried, and it was applied by a competent radiologist, benefit being derived for a few weeks. After that the ulcer rapidly extended, and when he (the speaker) saw him a few weeks later there was a leathery induration of the skin around the ulcer, the appearance being such that any surgeon would have hesitated to excise the growth. He (Mr. Rayner) did a removal *en bloc* by diathermy. The wound healed soundly in three months; the anal orifice was now contracted so that it would only admit the index finger, and when the bowels were loose the patient suffered from incontinence, but otherwise there was no complaint. He has been leading an active life, and in comfort for the last six months.

(5) The next slide illustrated the type of cancerous breast which he regarded as suited for palliative treatment by diathermy. In such a case as that the patient, if free from abdominal or other distant metastasis, could have his life lengthened and made more comfortable by diathermy excision.

DR. THOMAS MARLIN

said that there was a misconception in certain quarters as to the course taken by the diathermy current. It was spoken of as a penetrating current, heat being generated between the electrodes, the idea being that there was no diffusion of current. Some thought that the current might pick out certain tissues. He had been making some experiments in order to determine the course of the diathermy current. The current did not cook an egg in the way usually supposed; it cooked at the end of the terminals. (Sketch shown.) He then experimented on a turnip. He first soaked the turnip for an hour in a very strong salt solution, and so pared the ends that there was a practically flat surface to which the electrode could be fitted. He placed thermometers at points where they would be out of the direct path of the current. (Sketch shown.) Next he used a chop which included two pieces of bone. One thermometer was placed in a bone, and another in muscle. The observations showed

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that the current did spread a little, although it was a penetrating current. Heat was not generated in one tissue more than in another. Damage would not be done to the deeper tissue before the superficial tissues had been affected, and under normal sensation the patient would give early indication of trouble.

MR. G. GORDON-TAYLOR

said he would refer to diathermy for malignant growths in a few regions of the body. His experience had been greatest with growths in the oral pharynx. After an experience of 100 cases of operable carcinoma of the mouth treated by diathermy, eighty-four of which were carcinoma of the tongue, he felt convinced that the ultimate results of carcinoma of tongue treated by diathermy were better than by the old method of scissors or knife. The only objection to the method seemed to be the increased risk of broncho-pneumonia following. The mortality had been very high but 50 per cent. of those patients who got over the first few days after the operation remained free up to six years, which was the time during which he had been carrying out the method.

Another risk which was usually said to occur in connexion with diathermy was secondary hæmorrhage. He had only had two cases of it in the eighty-four cases of carcinoma of the tongue, one being slight, and the other, one in which the lingual artery had to be secured. The patients survived the operation.

Undoubtedly diathermy was very useful in alleviating suffering from inoperable malignant growths of the mouth. He had used the method for malignant growths of the bladder, and for inoperable carcinoma of the breast, in the way Mr. Rayner had indicated. During the last ten months he had had experience of the "light-arc treatment," used by Mr. John Anderson, of Dundee, but he thought the method originally came from Sweden, and had been brought to England by Mr. Anderson. Mr. Anderson claimed for the method complete freedom from local recurrence; when he (the speaker) was in Dundee, Mr. Anderson told him he had had no case of local recurrence at all in his operations on carcinoma of the breast. He (Mr. Gordon-Taylor) had only treated seventeen cases in this way, and all the patients were in an extraordinarily good condition when they left the operating table.

The patient on whom he (Mr. Gordon-Taylor) saw Mr. Anderson operate was a fat woman, with a large carcinoma of the breast. Under the old operation she would have been expected to suffer a good deal from shock, but her case caused no anxiety to her surgical advisers.

Diathermy, he considered, held out considerable advantages over the old knife method.

It was difficult to know what to do with inoperable cases of carcinoma of the breast, as hospital beds in London were very precious, and it was difficult to find convalescent homes to take the patients, as these diathermy cases required such frequent and extensive dressing.

Another class of case in which diathermy was useful was that of the ulcerating carcinoma. Three years ago he operated on a patient who was suffering from a horrible carcinoma of the breast. She had been to herbalists and others, and only called in her doctor because she had an alarming hæmorrhage. Her breast was taken off by means of diathermy, and she was then transfused. There were no enlarged glands evident.

The portable diathermy apparatus served all the needs of a general surgeon.

MR. JOHN EVERIDGE

said that diathermy had great advantages compared with other surgical measures in the treatment of papillomata of the bladder, and the results obtained by it at his hospital were good. Recurrence seemed to be frequent after the use of the cautery, and that was scarcely to be wondered at, as one simply destroyed what papillomata could be seen; the operation did not overcome the tendency of the bladder to form papillomata. There did not seem to be a tendency to sepsis of

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the bladder after this method had been used. Secondary hæmorrhage occurred with considerable frequency, with a fair amount of bleeding at the end of the first week, though he had never yet encountered a case which had caused him any great anxiety.

With diathermy the treatment of carcinoma of the bladder was a different matter; the results in the hands of himself and colleagues had not been good.

With regard to the treatment of the enlarged prostate by diathermy cautery—the operation of “forage”—it was a valuable method of dealing with enlargement when there was a projection into the prostatic urethra or the neck of the bladder. The method was not of much use in diminishing massive enlargement of the gland. Reference had been made to the small amount of scar tissue which was left after diathermy. Nowhere in the body was this of more importance than at the neck of the bladder.

The destruction by diathermy of intravesical projections of the prostate had therefore distinct advantages, and, in his experience, there was an absence of post-operative trouble provided cases were carefully selected.

MR. PHILIP TURNER

said his attention was directed to the treatment of malignant growths by the high-frequency current at the Surgical Congress in Paris in the year 1908, where a remarkable series of cases were shown. On his return he consulted his colleague, Dr. Iredell, and together they treated malignant growths by fulguration. In 1909, at the Paris Congress, he found the method then employed was diathermy, and on his return from those meetings, Dr. Iredell and he began to treat cases of malignant disease by diathermy. They soon concluded that diathermy was very superior to fulguration. He feared that at the start, with both methods, cases were operated on such as they would not select now. Still, after a little experience, more or less the right kind of case was chosen.

One of the remarkable cases his colleague and he had shown at a meeting of the Clinical Section on December 8, 1911.¹ It was shown, with another case, as being the most remarkable they had ever had. The operation was carried out on May 29, 1910, on a man who had a large rodent ulcer on the cheek, which had penetrated to the mouth, and invaded the mucous membrane of the superior maxilla and lower jaw, and had opened the antrum. It had also extended towards the fauces on the deep surface of the masseter muscle. By means of diathermy the growth was destroyed, and the huge ulcer completely cicatrized. Afterwards, Mr. Pearce, dental surgeon at Guy's Hospital, made an obturator to fill up the gap in the cheek, which was continuous with the mouth, and in that condition the man was shown at the Clinical Section.

The other man also had a large rodent ulcer of the cheek, and the lower part was treated successfully by diathermy. But the patient was blind in one eye, and the ulcer was approaching the lower lid of the other. At the upper part, diathermy was not applied: it was left for excision.

Indications for Diathermy.—The best results were obtained in rodent ulcer cases, and the type of rodent so treated was that which was too far advanced for ordinary excision, or in which the anatomical situation of the ulcer was such that attempts at excision were not desirable. Suitable cases also were those of carcinoma and epithelioma, especially of the tongue, the fauces and the floor of the mouth, and also in the pharynx. Another indication for the method—which had not so far been mentioned in the discussion—was where there was extensive breaking down of tuberculous glands in the neck. He had had two or three

¹ *Proceedings*, 1911-12, v (Clin. Sect.), p. 95.

such cases, which had been scraped, and in which a number of sinuses were present, and firm healing followed the application of diathermy. He did not propose to take up time by detailing results, as they agreed with what had already been reported; the features were absence of pain and shock, a healthy granulating surface, and a remarkably supple scar.

Little had been said in the discussion about accidents in diathermy. He had been doing the operation for eighteen years, and he could recall (1) three instances of burns, one of which was a bad one; (2) four secondary hæmorrhages—all from the lingual artery, one of which was fatal; and (3) one explosion. He made it a rule that no ether should be in the operating theatre when this process was being employed, as had happened in this particular instance. Since then he personally saw that no ether was in the theatre before operations were begun.

Diathermy was especially useful in cases of malignant disease in the region of the mouth and pharynx, because to a great extent it enabled one to do without those extensive and mutilating operations which were so frequently disappointing in their results. The mutilating procedures were operations for exposure of the growth, and to a certain extent, as Mr. Steward had pointed out, these operations had also to be done when diathermy was the method employed, as it was so important that the operator should see the growth he was dealing with as well as its attachments. Still, with diathermy these exposing operations need not be so extensive as in ordinary surgical removal. Generally speaking, he had found that, locally, the results were satisfactory, but as so many of the patients, especially those with a growth in the mouth region, died from recurrences of the disease in the neck, it had occurred to him, some time ago, that it might be possible to guide the diathermic current so as to concentrate it along the course of the lymphatic tract, and thus bring about a more efficient destruction of the growth along that tract. He had tried colloidal copper for this purpose, injecting that substance for a number of days before the operation, and then applying diathermy, his idea being that the colloidal copper would be taken up by the cells of the growth in the lymphatic tissue, and that the current would be guided there. He thought that what happened was that the colloidal copper impaired the vitality of the cells and so enabled the diathermy to act more satisfactorily. He had now tried that many times, and was convinced that it did exercise a distinct effect on secondary deposits in the glands.

One such instance was a case of inoperable carcinoma of the floor of the mouth, with a great mass of glands on both sides of the neck. After the operation the glands on one side disappeared, and on the other side they diminished in size, but later again increased. And he had seen other cases in which the glands diminished after the operation.

By placing the hand on the side of the neck treated, one was conscious of a distinct heating effect, away from the neighbourhood of the electrode in the mouth.

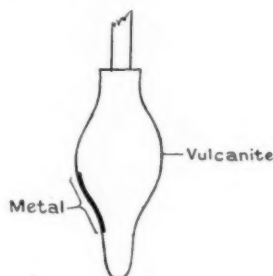
Diathermy was certainly of great assistance in dealing with malignant tumours, especially in the situations he had indicated.

Dr. C. G. TEALL (Birmingham)

said he desired to refer to one point, namely, treatment of growths in the œsophagus, a region in which, for many years, it was considered dangerous to use diathermy. Considering that, from a patient's point of view, anything was better than a gastrostomy, Mr. Musgrave Woodman and he had tried using diathermy for carcinoma of the œsophagus. By employing a specially designed electrode, palliative results of a

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satisfactory nature had been produced. The electrode was carried on the end of an insulated rod, and it was shaped thus:—



The body of the cone consisted of vulcanite, with a small metal plate let in at the side, so that, as the electrode was pushed down the œsophagus, the metallic section only burned through the growth. This allowed a considerable restriction of the area to be burned. Two electrodes were used; in one the metal sector was let in transversely, and in the other it was placed vertically. When working down the œsophagus, with an electrode at the end of a very narrow insulating stem, the difficulty encountered was that of keeping it in contact with the growth, and the cone-shaped electrode was a means of ensuring contact. More recently they had also used a modification of an electrode elaborated by Mr. Wright, of Bristol, in which the upper surface of a Jackson's bougie was made of metal, the lower part consisting of insulating material. In the modified form the metallic portion was rounded, instead of having a sharp, cutting upper edge. The cone-shaped electrode was used for a growth through which it was impossible to pass a bougie, and, where it could be passed, the Jackson's bougie electrode was used.

Mr. C. P. LANKESTER

said he had used diathermy in a few cases of hæmorrhoids, and was astonished at the almost entire absence of pain felt by the patient. For this reason alone he regarded the method as by far the most satisfactory for dealing with this condition, and there was in addition the important fact that patients were able to be up on the third or fourth day after operation.

Dr. G. B. BATTEN (Chairman),

referring to Dr. Cumberbatch's description of the treatment of hæmorrhoids by the method as carried out by Dr. Bierman, namely, pulling down the piles and subjecting them to diathermy, said that he himself had heard Dr. Bierman's paper, and understood that he (Dr. Bierman) also coagulated the tissues around the base of the hæmorrhoids.

Dr. CUMBERBATCH (in reply)

said that Dr. Bierman, in New York, injected 1 per cent. novocain, with adrenalin, into the sphincter ani, at four spots—north, south, east and west—and, with two fingers, easily dilated the sphincter, and so brought the hæmorrhoids into view. He then connected the patient to earth and directed sparks of one to one-and-a-half inch in length from a needle electrode, connected to a resonator directly on to the pile and its base. In this way the hæmorrhoids were reduced to small dry masses.

Cumberbatch: *Discussion on Diathermy*

With regard to cutting and coagulation, he thought that the process should be preceded by circumvallation, assuming that the malignant growth was freely movable over healthy tissue. Having thus procured a protective barrier, or rampart, of coagulated tissue, hæmorrhage did not take place when excision of malignant tissue was proceeded with. It was also safe, after circumvallation, to excise a piece of the growth for microscopical examination without fear of artificial metastasis. American operators had now largely discarded the use of the disc, and they employed circumvallation as a preliminary, and then used the Wyeth sector and excised the growth.

He understood that Mr. Gwynne Williams had said, with regard to recurrence, that the results of diathermy were no better than those of ordinary surgery. If he heard him correctly, it meant that Mr. Gwynne Williams's results were not as good as those obtained by other workers. In Baltimore, both Howard Kelly and Joseph Bloodgood had discarded the knife in the treatment of accessible malignant growths. Kelly used circumvallation and followed it by using the Wyeth sector. Bloodgood had not been converted to diathermy when he (the speaker) saw him.

Experiments made with vegetables were very interesting, but he did not think conclusions could safely be drawn from them in regard to living tissues of animals and human beings. The subject of the distribution of heat and the diathermic current through living tissues was one of great complexity. Frequency, voltage, and the type of conductor played important parts in deciding the distribution of the current.

He had been glad to hear Mr. Gordon-Taylor's experience of the new method. It should receive a wide and thorough trial. The immediate results, such as the lessening of shock and the diminution of pain, had been observed by Mr. Anderson, of Dundee. It was unfortunate that the patients of some workers had suffered from broncho-pneumonia afterwards, but that was not the experience with the method at St. Bartholomew's Hospital.

He did not think the arc method had been devised in Sweden. It was practised as far back as the early days of surgical diathermy, perhaps even of surgical high-frequency, and De Forest, the physicist, performed the original experiments. The idea was afterwards adopted by Czerny in Germany, and by Eitner in Vienna, and the pupils of the former practised it. Mr. Anderson said he saw it used in 1923 in Stockholm.

With regard to the use of the method for prostatic conditions, he knew the work of Professor Luys, of Paris, and a few months ago he had had a patient who had had it performed on himself. This patient highly praised the method. The anæsthetic he received was a hot solution of antipyrin in the rectum. He felt no pain during the operation, and the urinary stream remained full for two years afterwards.

Nothing had been said in the discussion concerning the use of diathermy for carcinoma of the cervix, and he thought that this disease ought to receive a thorough trial of the treatment in early cases. Advanced cases, with infiltration into the pelvic cellular tissues, were unsuitable.

By the electro-desiccation method, which he described in the paper, it was possible to restrict the area of destruction very exactly. American workers stated that it was possible to destroy papillomata of the vocal cords without damaging the latter, and new growths of the eyelid without harming the orbit.

Under use of the indifferent electrode, burns could be avoided by the use of proper technique, and secondary hæmorrhages could be obviated by preliminary ligation of arteries. The hæmorrhage which took place within two or three days of the operation was usually the result of operating on patients who were subjects of cachexia and wasting; such patients were unsuitable for treatment by diathermy.

He knew that explosions had occurred, and he had been told of an accident of this kind in which the operating theatre had been wrecked, the attendants stunned,

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and the patient's clothing set on fire, despite the fact that a member of the present audience had previously told the house surgeon not to use ether. But there was a preliminary delay, and the injunction was forgotten. Ether was used, with the disastrous result above described.

Mr. STEWARD (in reply)

said that he was glad to learn, from the work of others, that his pessimism in regard to employing diathermy where bone was involved, was not well founded. He would, therefore, try again in those cases. The cases narrated in the discussion, supported by some remarkable photographs projected on the screen, demonstrated in the clearest possible manner the great use of diathermy, even at the present day, and he ventured to believe, especially in view of what had been said of Mr. Anderson's method, that there would be further improvements in the near future.

Dr. G. B. BATTEN (Chairman)

said that no remarks had been made that evening which were not well worth hearing. More and more about the method was being learned, and it was likely to be increasingly employed. The frequency of currents in diathermy machines varied with each make. Professor Philipsson (of Brussels) showed a few years ago (1923) at the Section of Electro-Therapeutics, that the penetrability of the tissues by the current depended very greatly on the frequency, because the resistance of the tissues depended so much on it. There was much yet to be learned in this respect.

